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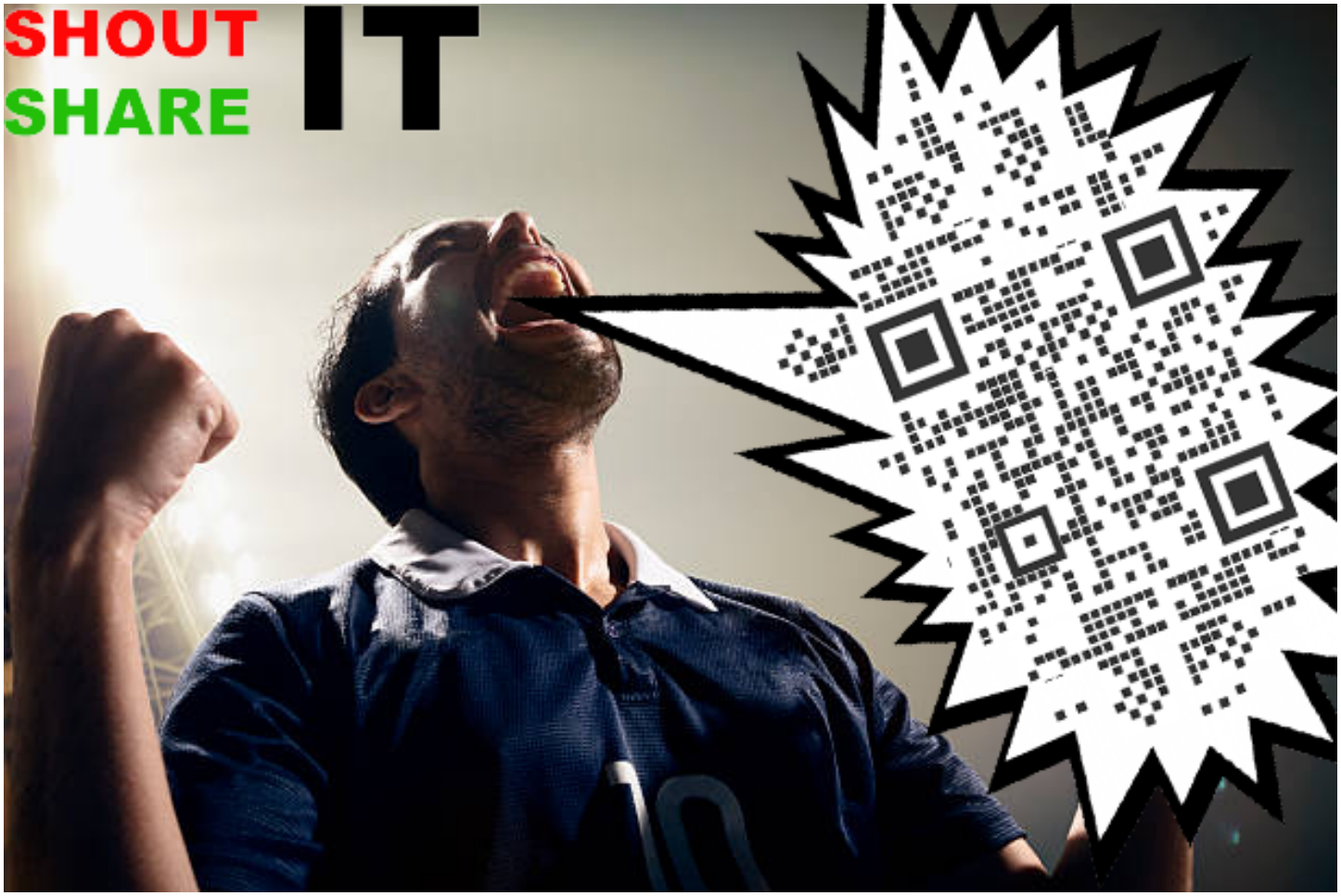
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Collection and Field Note Book

No. 35

(March 10, 1952 - December 16, 1952)

(34417 - 34956)

(No. 1 to 46, E. L. Greenitt Coll.)

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No. 33

(March 10, 1952 - December 16, 1952)

(34417 - 34496)
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(Continued from Book No. 32)

March 10 – Bar somewhat north of Bik Islet – gravel bar, submerged at ~~low~~ high tide. Not held, as far as can be seen from lagoon, by any beach rock or other stable material. Seems to represent a balance between the strength of the lagoon waves and that of the sea waves weakened by their passage across a wide reef flat. At almost high tide there were small breakers on both sides of it.

At rather low tide the bar was well exposed and hundreds of noddies were holding a conference on it.

March 10 - Ally (Erlie) Islet

Three patches of coconuts, one near south lagoon point, two near center of islet.

Center of islet occupied by Pisonia grove 12-15 m. high - small grove of four large trees and half-dozen or so smaller ones, open beneath with only a few scattered Morinda and Allophyllus ~~seed~~ saplings, almost no ground cover - a few scattered small plants of Thuarea, Polypodium, and Ipomoea tuba (seedlings). Ground mostly bare and center covered by a layer of 2-6" of peat. (see p. 186-7 of Book 32 for description of this, sample #110).

This grove is on a very slight rise in the ground. Surrounding it is mixed open forest of Pisonia, Pandanus, Terminalia and two of the patches of coconuts.

Undergrowth and ground cover similar to that in Pisonia grove but a little more dense, same composition but with addition of Boerhavia tetrandra and ~~the~~

seedlings of the dominant trees, much more Allophyllus. One Terminalia samoensis tree is about 10 m. tall, with 3 main branches from near base each 3 dm. thick.

Lagoon side rather sandy, with one continuous low ridge along beach, a second back of it interrupted by a depression in middle. The n. end of this second ridge corresponds with a piece of lagoonward dipping beach-rock on the passage beach. The ridges ~~is~~ are covered by rather tall but sparse mixed scrub forest, with a patch ~~of~~ of young coconut trees, 5-4 m. tall on ~~so~~ south end, one or two on north, Messerschmidia and Scaevola dominant, much Xiphenia in undergrowth. Weedia in opening + tangled in undergrowth.

South passage beach, except for ~~to~~ gravel beach on lagoon end, a steep boulder beach up from reef-rock, on top of this a beach and weak ridge of pebble to cobble

size ~~rocks~~ stones. along this passage a ~~scrub~~ forest of Messerschmidia and Pisonia, interrupted by patches of Scaevola scrub ~~and~~ with scattered Messerschmidia trees taller than the scrub.

Leeward apex of islet and outer 50 m. a flat of broken coral at height of passage ridges. In from this is rubble getting finer toward the lagoon. Along the north passage is a cobble ridge, weak at seaward end, stronger lagoonward. The outer half of islet, except in ~~very~~ center, is a sparse scrub or scrub-forest 3-5 m. high of Messerschmidia, Scaevola, Pisonia, Guettarda, with Wedelia tangled in it and in openings, ground cover of Boerhavia and Polypodium.

Lagoonward half of north passage beach lined by almost pure stand of Cordia, with some Pisonia, between coconut patch and beach

and extending in both directions. absolutely no undergrowth or ground cover. Canopy very sparse at this season.

Hermit crabs very abundant on this islet, in day-time hiding in and under rotten coconut logs, trash, etc. Large series collected (Jars 13, 14, 15) to see how many species represented. Color patterns vary considerably. Of large red species, color varies from scarlet to brick-red to brownish-red.

March 9 - Biginnigar Islet (Bikenibeu)
A flat triangle of sand and fine rubble coarser toward the windward periphery where there is a boulder beach and, on the south-east side, at least, thickly scattered boulders along the edge. Center rather sandy. Leeward beach a broad sandy beach prolonged into two horns at the corners, these curving to leeward.
Vegetation a sparse mixture of Messerschmidia, Scaevola, and Guettarda, a few Pisonia, intro. scrub-forest to leeward, becoming lower to windward. Much open ground between bushes to windward this covered by Lepturus, Cassytha, Zinnfetta, Boerhavia tetrandra, Polypodium. Through the central portion are scattered coconut trees, these very yellow and unhealthy-looking, some of them dead.
Leeward corner, on photo 1944

almost bare, now quite well vegetated with Scaevola and a few Messerschmidia, some of the latter of good size (3 m. ±).

Judging by the photos and present observations the island is adding sand on its inner side and the sand horns at the corners change shape very rapidly.
(Chief Chtiis father told MacNeil that during the strong trade-wind months these horns on all islets) bend strongly inward, while during June to September they straighten out parallel with beach. This should be checked with photos of M.I. project)

Mar. 9 - Enylamoj Islet

On south half of leeward reef flat are scattered large boulders.

Greater part of island planted to coconuts, fairly closely spaced, mostly healthy looking, except for one spot toward seaward side about 1/4 from north end, where the trees are yellow, some have died, even the seedlings are very yellow (shows as a light spot on photo M1-38-25).

Soil generally sand to fine loam, locally fine rubble, gray to gray brown.

A few areas have been cleared out recently and have a ground-cover of Tournefetia, Fimbristylis, Polypodium, etc. Large areas with mat of Wedelia 1-2 m. thick. Others with thickets of Guettarda, Morinda, Scaevola, etc. One patch of Intsia near n.w. corner, and scattered in plantation generally.

General second story of Pandanus, scattered to quite frequent, locally in very sparse spots in plantation Pandanus

could be called dominant.

Locally in north half, near center, (dark trees in M1-38-25, 26) are patches of seedy var. of breadfruit. No undergrowth or ground cover here except scattering of breadfruit seedlings up to 3-4 dm. tall.

Here and there patches of mixed forest, Pisonia and Ochrosia, Intsia, Pandanus, etc. and, especially toward south end, patches of Ochrosia forest, some of these, toward windward beach, very yellow (light area on photo near beach), some tops dead.

Fuzzy-looking trees south of light spot on photo M1-38-25 are Pisonia.

Leeward beach is sand and fine gravel. At top is an interrupted narrow belt of Scaevola scrub.

Beach around north west coast very broad, sandy, no significant seaward ridge. Around on northwest side a sand ridge is well developed but tapers off southward. This coast lined with broad belt of tall scrub or scrub forest of Scaevola,

Messerschmidia, Guettarda, etc., tangled with Wedelia, Cassytha, etc. Soil here very sandy. Scrub immediately at top of n.e. beach relatively low, mostly Scaevola. This scrub extends southward along entire east beach, becoming taller, scrub forest on boulder ridge.

North-East beach is of boulders except about 200 m. at each end, which is sand. The boulder ridge is low, perhaps ~~[illegible]~~ 30 m. wide, covered by scrub forest described above, which extends inward for some distance with addition of Pisonia, Pandanus, Ochrosia, etc. Tongues of it extend well into coconut plantation. Here and there, in mixed forest near beach are small groups of very wind-beaten and bedraggled coconut trees.

boulders thickly scattered 30 m. inward, but with much sand around them.

Along ~~east~~ east side of south end are small dunes. Beach here is sand. Scrub belt narrow here. Much mixed forest in plantation

on seaward side.

South end a sand flat with sparse Scaevola scrub, much bare sand.

Birds seen on Ujae atoll.

According to chief Enti, all sea-birds are eaten, young & old, but heron is not eaten, as it eats rats.

MacNeil reports seeing a noddy (which one not determined) pick up a neritid snail from reef, fly high in air, drop it, following it down, so its shell broke on rocks and it could be eaten. This accounts for numerous freshly broken neritid shells on rocks (sample # 111 from Bock I., Z. coll. MacNeill).

Frigate birds (Fregatta minor)
A large colony of at least 75 birds live on Pokainuk Islet south of Bock Channel, where they may be seen roosting in some numbers in Pisonia trees almost any time. At sunset they are soaring in great numbers over the channel. A few of them have no white at all, either beneath or on heads.

"oali"*

Brown booby — "kalo"
About 30 seen in evening (Mar. 1) returning to Pokainuk Islet after day's fishing. One seen on Ujae I. (Anno), one on Biginnilyar

Red-footed booby —
One seen dead on outer beach of Rua I. on Feb. 23.

Common noddy — "fijuali"
At least occasionally seen on all islets, some seen gathering nesting material in forest on Bock I.; hundreds seen on Pokainuk I., quite a few on Rua I. Feb. 24, three nests in Terminalia tree on seaward side. The nests may be distinguished from those of the white-capped noddy by being as much as twice as large, of looser construction, made largely of twigs, not

much stained with guano. On Wotjin Islet, over the lagoon beach, six noddies were seen vigorously pursuing a fairy tern that had a small fish in its beak. The chase lasted several minutes, but in spite of the wavering, fluttering type of flight of the fairy tern it got away from its apparently sure flying assailants.

On Bigiñhigar Islet, at low tide, March 9 an enormous flock of hundreds, even thousands of noddies blackened a long sand-spit uncovered at low tide. They were holding the usual "conference" so characteristic of common noddies. In the afternoon, at high tide many were flying over the islet. One nest with an egg in it was found in a bush about 1 m. above the ground. The egg was white with brown markings. The old bird protested and flew around close by, trying to drive me off.

Many were seen flying about Enylaginij Islet, and they were abundant on Allinglab. Here one was nesting in a big crotch of a Pisonia tree about 5 m. above the ground. ~~Here~~ The nest in this broad depressed crotch consisted of very little material, a few twigs and leaves, not at all typical for this species.

On Ujae islet only six noddies seen. This islet is where the people are concentrated. (Mar. 13)

White-capped Noddy — "jagarik"*

Feb. 16-21 Nesting abundantly and gregariously ~~and~~ in Pisonia trees on Bock and Pokainuk islets, and to be seen in hundreds flying around these islets. Young fully feathered but not yet flying. Natives collect these young in considerable numbers

to eat. They built a fire at base of a huge Pisonia loaded with nests. It burned all day and finally one half of the tree fell. at least ~~[illegible]~~ five or six dozen young were collected. called "nemajelij kon".

Common on Ally Islet, a dozen nesting in close group in Pisonia and Terminalia trees, Mar. 10.

Many nesting gregariously on Rua I. ~~Feb.~~ 23. The nests may be distinguished from those of common noddy ~~[illegible]~~ because they are smaller, more compact, built mostly of leaves (Pisonia and Messerschmidia), badly stained with white guano. Usually found in groups.

Fairy tern "mejan" *

Seen occasionally at any hour of the day carrying ~~a~~ small fish in their beaks.

Many in trees and flying overhead on Boch, one young one in pinfeather stage, Feb. 18.

Hundreds flying overhead on Pokaikuk I.

Hundreds also seen on Rua, Feb. 23, six eggs seen, three on Messerschmidia, three on Pisonia, one broken one under Pisonia. Two young almost feathered out.

Only occasionally seen on Ebeju Islet, rare on Ujae.

Hundreds seen over Bile, many on ~~[illegible]~~ Enylamij.

Abundant on Ally Islet, one ~~nesting on~~ with egg on Pisonia branch at about 8 m., drove off noddy when it approached.

One ~~on~~ over lagoon near Ebeju with fish in mouth out flew and eluded six common noddies that were pursuing it.

Black-naped tern

One seen flying over south end of Bok I. Feb. 19.

Seven on Rua, on inner south sand-spit of islet Feb. 22. Two nests here on bare gravel flat at base of sand spit, just above high tide level. Eggs laid on absolutely bare gravel, 2 in one clutch, 1 in other, very well concealed by resemblance to surroundings. Eggs identical in size shape, color and marking with those of Gygis alba - gray ground color with scattered brownish mottling, 44 mm. long.

Four seen on inner southwest sand spit of ~~Bok~~ Ally Islet, Mar. 10; one clutch of two eggs laid on small collection of pebbles on bare sand, just above high tide, very well concealed, only the frantic protests of the birds calling my attention to the eggs even though I had been walking around them for some minutes. Looked for them carefully before

locating them. They were exactly as described above. As long as I was in vicinity, even all during time I ate my lunch sitting on rock 50' away, the four birds protested noisily, "yak, yak, yak" "yip, eep, eep" "aa" "yak, yak, yip" etc.

Crested tern - "ke'er" (name tied to this specie by description by native, only, as no bird seen when native was present).

On Mar. 8, two seen over lagoon, Ebejul.

On Mar. 9, three seen on Biginniga and one over lagoon in north part.

On Mar. 10 eight seen over seaward reef flat, Ally Islet.

On Mar. 13, one seen over lagoon near windward reef about 2 mi. n. of Ujae I.

Pacific Golden Plover
— "Kolej" *

Not as common here as on some atolls.
Two seen on reef flat at north end of (Bock).
One seen on Rua ?.
On Ebeju one was seen on lagoon beach in flock of turnstones, ~~[illegible]~~ in flock on seaward beach.
Four in flock with turnstones and curlews on (Wotjia ?). on reef flat.
Two seen on north end of Enylaniej ?.
Four in flock with curlew on Ally ?.
On Ujae one seen on south beach and one on east end beach.

Wandering tattler - "Kirij"
Most often seen on exposed reef flats or rubble flats, ~~[illegible]~~ usually on seaward side of islets.
On Bock ? slet four were seen in a flock on the outer reef flat, two together on rubble flat on lagoon side.
One to three seen on each of Ujae, Rua, Wotjia, Ebeju,

Ally, Biginnigan, and Enylaniej islets.
Note, usually sounded when they fly from one spot to another, is a high "dee-dee-dee-dee-dee". They usually fly low over reef or sea just outside it. On Enylaniej seen in flock with turnstones.

Turnstone "Kutkut" or "Kutekut".
Five in flock seen on outer reef, north end of Bock ?.
Flock of 7-8 on Ujae (Arno), flock of 5 on outer reef (Asbey).
Four seen on Rua ?, one of these in grassy opening in interior.
Flock of 10 on ~~[illegible]~~ lagoon beach, one of 5 on seaward reef flat, Ebeju ?.
Flock of ~~[illegible]~~ 7 on outer reef flat with plovers and curlews, Wotjia ?.
Flocks of 14 and 7 on north and northeast beaches of Enylaniej ?.
Flock of 9 on passage beach, Biginnigan ?.

Bristle-thighed curlew - "kowak"

Considerable variation in amount of chestnut in plumage.

On Bock Islet 1-3 to be seen almost any time on different sides of islet, probably same ones, one seen in rocky opening in heaerola scrub.

4-5 on Rua Islet, seen several times.

2 seen on seaward reef of Ebeju I.

1 on Wotjja (with plover and turnstones).

1 seen near southend on east side of Enylamij I.

5 seen together on south passage beach, Biginnigar I.

1 seen with plover, three seen ~~on beach~~ together, on Ailinglapalap I.

Large dropping, frequently seen on beach filled with heaerola stones must belong to this bird.

Note when flying "kiwee, kiwee"

Whimbrel

Less common than Bristle-thighed curlew.

One seen on Ujae by Anna, one by me (identified by note rather than color).

One on Rua I., not certain if it was this species.

Two seen on seaward reef, Ebeju

Note when flying "dee-dee-dee-dee-dee". This is often best means of distinguishing this species from the Bristle-thighed curlew.

Reef Heron - "kawij" or "kawij"

Only white and dark phases seen, all occurrences listed below, though some may be repeated flushings on different days of same bird.

White	dark
Bock 1	Bock 1
Ujae 2	Ujae 3
Ebeju 2	Ebeju 4
Wotjja 1	Enylamij 1
Bik 1	
Biginnigar 1	

March 13 - Ujae Islet -

34417 Artocarpus altilis (Park.) Fosb. — tree 15 m. tall, 5 dm thick, buttressed at base; leaves variable in outline.
common mixed with coconuts in interior of islet

18 Premna obtusifolia R. Br. — small tree, sterile.
one tree seen in village

5 19 Allophylus timorensis (D.C.) Blume — small tree 5 m. tall; flowers white.
~~common~~ occasional in scrub along passage (~~common~~ occasional also in plantation)

5 20
on coral boulders in scrub on seaward side

4 21 Pseuderanthemum carrutherii var. atropurpureum (Bull.) Fosb. — shrub, m. tall; leaves dark bronze-purple, flowers purplish pink thickly dotted with red.
cultivated in village

#112 - drift seeds from Ujae
#113 - drift seeds from Ailuk

Vial # 133 - ants from large colony in rotten coconut trunk, Ujae Islet, Mar. 13. Sting painfully. Also a small milliped from same coconut trunk

Vial # 134 - ants and associated scale insects - scales on panicle and calyx of coconuts, ants running up and down tree, tending them. beetle flying.

Marshallese word for Tridacna gigas - "kabuni"

1952 Marshall Is.

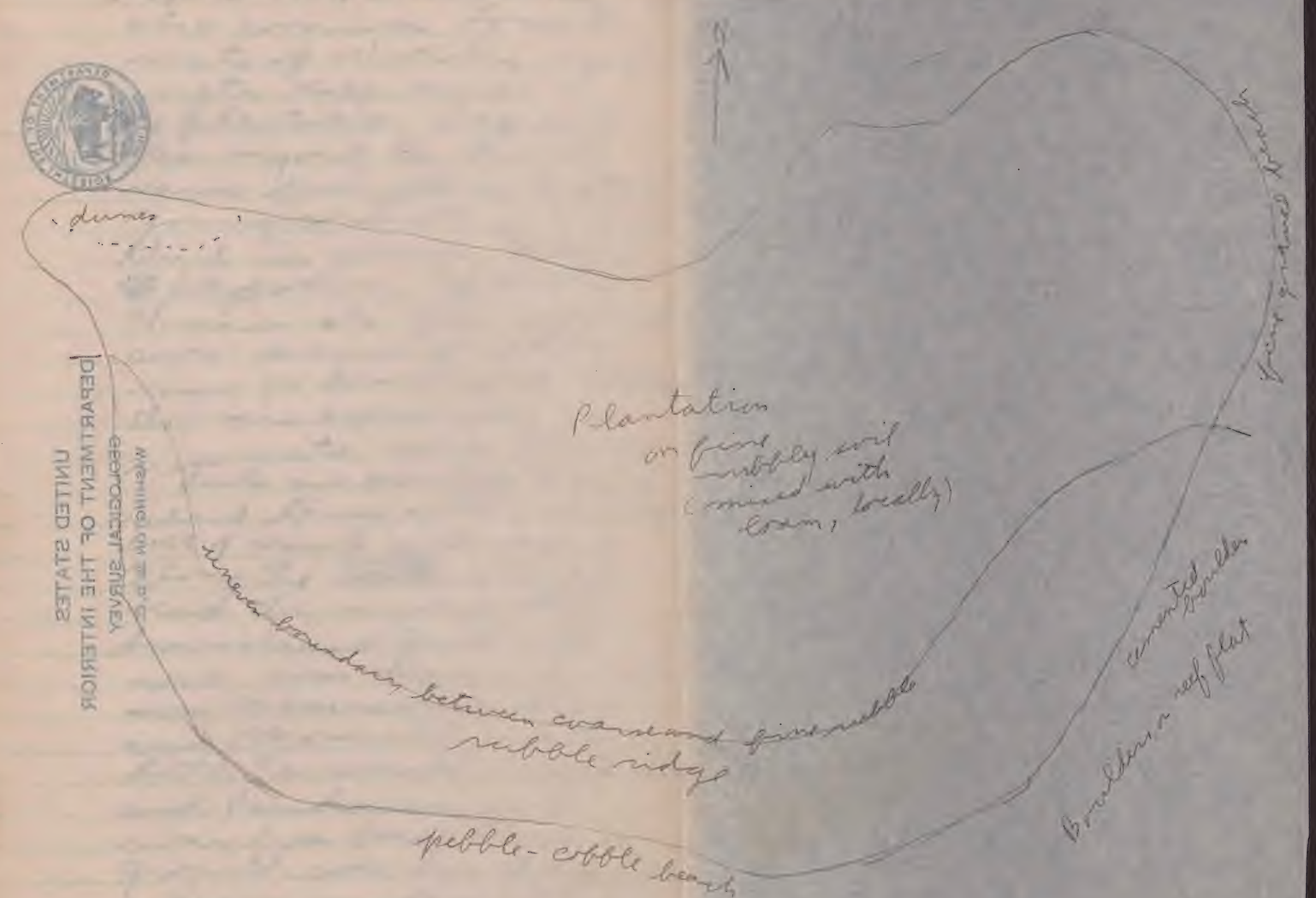
Mar. 13 - Ujae Islet.

On seaward side entire beach is of pebbles & cobbles, steep, its crest forming a small seaward ridge. This beach and ridge hook around on both ends, to half & two thirds the width of the islet.

Back of the beach is a very broad low ridge gradually and unevenly fading off inward to small rubble and soil about 150 - 200 m. in from beach. The remainder of the islet has an unevenly flat surface of fine rubble or rubble and gray & blackish loam, mixed, this resting on rubble a few inches down.

The island is mostly planted to coconuts, mixed here and there with breadfruit, very locally with Pisonia. The second story is of scattered Pandanus, locally Guettarda, with Papayas quite common beneath. Some bananas, but these looking markedly yellow, much more so than when we were here a month ago. Allophylus and Morinda,

especially m



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inter we were here a year ago. Allophyllus and Morinda,

especially Morinda, are also common. Locally mats of Wedelia up to a meter deep occur in the plantation. Degree of clearing out the brush varies from place to place. Young coconuts are very thick in places. Vigna, Polypodium, Leptura, Thuarea, etc. form ground cover, any one of which may be dominant locally, the Vigna especially so near outer edge of islet.

Outer and passage edges of island lined with a narrow belt of scrub a scrub post. Along the ~~north~~ west passage beach this is composed of Scaevola and Guettarda, with some Messerschmidia ~~and~~ Messerschmidia and Morinda, with a little Terminalia, Allophyllus and Pandanus, and, away from beach, Pisonia. Ground cover here of Leptura, a Vigna or a mixture of both, or with Triumfetta and Thuarea. Some Wedelia tangled in this belt.

around the west end and looking around the western part of the seaward beach is a curved outward dipping bed of beach-conglomerate, mud, eroded and pitted even discontinuous in place. 10-20 m. out from present beach forming a low cuesta. Possibly indicates a former shoreline.

The western end of the seaward beach is coarse gravel with a very broad (150 m. ?!) rubble ridge behind it. The outer edge of this, for varying widths, is covered by almost pure Scaevola scrub, with a little Guettarda and Messerschmidia. Inside this, the rest of the rubble ridge is cleared and planted to coconuts. The ground cover here is of Vigna with Leptomna, Wedelia, and Polypodium. In places soil is accumulated on top of ridge. The surface is very uneven. Eastward the outer ridge becomes sharper and stronger and the broad rise no longer higher.

further in Leptomna becomes dominant and Tacca, Polypodium, Thuarea common

In the outer edge of the plantation Scaevola is a common small tree.

On the southeast coast the rubble changes to large boulders and the outer edge of the plantation gives way to Pisonia-Guettarda forest with a few scattered coconuts. Many seedling coconuts in undergrowth which is a tangled mass of Wedelia and Ipomoea tuba.

A little further along this is again replaced by scrub or scrub forest, mostly Scaevola at edge, mixed with Guettarda and Messerschmidia further back. Locally at edge there is a clump of large Messerschmidia trees. Here the pebble-cobble beach is very steep, rather undercut, but with few roots exposed even though cut back almost to bases of trees.

On the reef flat here boulders are very thickly scattered. On the east end these boulders are piled together and partially cemented into conglomerate on the smooth reef-flat surface. This seems quite recent.

The rubble ridge narrows rapidly north of middle of east end, and ends at same point where cobble beach gives way to fine gravel. The scrub belt narrows and becomes a scrub forest of Scaevola, Messerschmidia and Guettarda. There is much Pisonia and breadfruit and some Ochrosia in the east end of the plantation, as well as Morinda, Calophyllum and Pandanus in second story. Locally breadfruit is dominant. Papayas are abundant. Ground cover mainly of Thuarea and Vigna.

The interior generally has a gently rolling topography.

On the inner west corner

are low sand dunes.

March 15 - Kwajalein Islet
1 white reef heron seen on seaward reef flat.
Plovers common generally.
Turnstones seen flying over island.
Beach rock beds at northern end of islet on lagoon side and in passage dipping away from islet.

34422 green algae
in beach rock just below high tide level.

The dry spell has continued. The grass does not look much worse than at beginning of month, but some Fimbristylis seems almost dead.
Coconut and Messerschmidia trees transplanted from Marine compound to swimming pool, with quite small balls of earth on roots, are nearly dead, probably will not recover, at least unless there is rain.

(1) Probable component communities of original vegetation:

(a) Relatively stable a "climax" communities

1. Pisonia forest –
Tall forest, 20–30 m. high, canopy very dense except in dry seasons when trees may become more or less bare. No undergrowth except root sprouts, and usually no ground cover. Tendency to form peat on surface of ground. Usually a pure stand or almost so. Very widespread but relatively small stands.

2. Ochrosia forest –
Tall forest, 20–25 m. high or sometimes not quite so tall, pure stands, canopy very dense, no undergrowth except thick stands of Ochrosia seedlings which seldom attain more than 0.5 m. except under thin places in canopy. Peculiar tessellate appearance on aerial photos. Rather widespread ~~and~~ small to large stands.

3 Barringtonia forest –
Tall forest, 25 m. very large trees, pure stand, canopy complete, no undergrowth or ground cover whatever. Tessellate appearance on aerial photos, difficult to tell from Ochrosia, but finer grained. Only one stand known (Rae I. Rae atoll)

3a Intsia bijuga forest

3b Cordia subcordata forest

~~4 [illegible] forest~~

4 Pemphis forest –
Rather low forest – 5–7 m., dense, pure stand, usually dense lower branches, often dead, make penetration difficult and painful, usually on exposed rock, varies to a scrub in exposed localities, tolerates pure salt water over roots at high tides. A soft dull green appearance from a distance. Small stands but widespread.

5. Mixed forest — a variable mixture, basically Messerschmidia, Guettarda, and Pandanus, with usual addition of one or more of Pisonia, Intsia, Ochrosia, Allophylus, Premna, Cordia, Terminalia, and Soulamea. May vary in proportions and any of the secondary species may locally assume dominance, occasionally even form pure stands locally. This is usually tangled with Ipomoea tubd, often with Vedelia, often has undergrowth of seedlings of tree species. In opener places may have ground cover of Fimbristylis, Lepturus, a Thuarea, a Polypodium, a Triumfetta, or a mixture of the ~~two~~ ~~few~~ five.

The canopy varies from loose to complete. This varies to scrub- ~~a scrub for~~ forest a scrub, with addition of Scaevola, Suriana, Pemphis, etc. Scaevola scrub is an extreme of this but so commonly encountered that it should be treated separately.

(7) Instability is a normal characteristic of atoll habitats — storms, typhoons, tsunamis, etc. altering it by removal or deposit of material. Therefore stable communities may be expected to be relatively unusual.

(b) Pioneer communities:

1. Lepturus grassland — Pure stand of bunchy or loose mat-like Lepturus, with some admixture locally of other herbaceous species. Subject to invasion by woody species and by Cassytha. Persistence in places like Pokak (if the openings there are of this type) or on small dry windward islets must

be due to very dry conditions.

2 Fimbristylis grassland - Pure stands of Fimbristylis cymosa - occur usually on dry rocky substrate. May be mixed with other herbaceous species, ~~especially Fleurya~~ and tends to give way to woody types.

3. Scaevola - Messerschmidia scrub -
Sparse to dense mixture of these two components, with occasional addition of Pemphis, Terminalia, Suriana and Guettarda. This is an extreme form of the mixed forest community existing under very pioneer conditions and possibly developing into the latter. It is the characteristic early vegetation on sand bars, sand spits, denuded areas, etc.

4 Scaevola scrub -
an extreme form of no. 3, commonly of pure Scaevola frutescens, found as a fringe along almost all seaward beaches, sometimes on lagoon beaches. On windward coasts it may form a rather broad belt, sloping to windward, giving way on inner side to mixed scrub or scrub forest.

(3) Successional phenomena.

1. Messerschmidia tends not to reproduce itself in well-developed mixed forest.

2. The mixed forest — basically Messerschmidia, Guettarda-Pandanus, is, in more mesophytic habitats, a temporary community, in which the secondary components may, singly or in combination, eventually dominate.

3. The seedlings of Ochrosia, Pandanus, Soulamea and root sprouts of Pisonia tolerate their own shade and that of other trees very well. These, then, should under certain circumstances, be able to form relatively pure stable communities, and do. Intsia, also, can do this to some extent.

4. Ochrosia can seed

itself so effectively and does so well in the shade that it is able to crowd out other seedlings, and in the general Kwajalein latitude, at least, the presence of a healthy tree of Ochrosia means that the forest it is in is doomed to replacement by Ochrosia.

5. Allophyllus seedlings can get started if there is a thin place in the canopy, and have been observed invading ~~the~~ Ochrosia forest in the places where the Ochrosia is yellow and unhealthy.

6. Scaevola and sometimes Guettarda very successfully invade Lepturus grassland.

7 Wedelia can also invade Lepturus and may form a dense mat a meter or more deep, which is invaded only with difficulty.

8. Scaevola, Messerschmidia, Guettarda, Leptunus, Triumfetta. Vigna commonly appear as seedlings on ~~very sat~~ open sand or gravel, on beaches, bars, flats, spits, etc. where they are exposed to pure salt water.

9 Cassytha seems to be able to invade and parasitize anywhere except in deep shade.

(4) Processes occurring in atoll soils:

1. Deposition of miscellaneous calcareous materials by storm waves.

2. Addition of calcareous fine material or (lime) sand by wind. This commonly deposited around vegetation.

3. Addition of floating pumice.

4. Weathering of pumice.

5 Gradual solution of calcareous material.

5 Removal of material by wind.

6. Removal of material by storm waves.

7. Addition of sea salts ~~in~~ from spray and storm waves.

~~8) Binding of surface particles by~~

8 Addition of N, P, Ca, etc. ~~by~~ in guano by fish-eating birds.

9. Binding of surface particles by crust-forming blue-green algae.

10. Binding of loose materials by vegetation.

11. Percolation - seeping downward of rain-water, taking dissolved substances with it.

12 Capillary rise of water, bringing with it any dissolved material in top layer of free water lens, also any picked up on the way up.

13 Nitrogen-fixation by crust-forming blue-green algae (?)

14 Nitrogen-fixation by Rhizobia in root nodules of Vigna, Canavallia, and possibly other legumes.

15 Addition of humus from roots in ground.

16 Addition of humus from leaves, twigs, branches, and trunks on surface of the ground.

17 Retention of mineral matter in form not so readily leached out in organic material - plant and animal bodies, humus, etc.

18 Enrichment of mineral content of soil by ~~pro~~ weathering products of pumice.

19 Oxidation of organic matter exposed to air

20 Breaking down of organic matter by bacteria and fungi.

21 Breaking down of organic matter by crabs, millipeds, isopods, insects, snails and earthworms.

22 Bringing of unaltered materials to surface by burrowing land crabs.

23 Evaporation of water from surface of soil.

24 Extraction of water by roots.

25 Extraction of minerals by roots.

26 Formation of Pisonia peat.

27 Solution of $Ca^{P}PO_4$ by peat acids.

28 Solution of $Ca^{P}CO_3$ by guano acids.

29 Cementing of sand under peat and guano.

30 Reduction of guano increment by frightening off or destruction of sea-birds.

31 Composting of taro pits.

32 Muck-formation in bottoms of taro pits.

33 Stirring up of surface layers by chickens and hogs.

34 Removal of P in copra exported.

35 Burning of coconut trash and other dead plant materials by natives.

36 Reduction of soil fauna and flora by this burning.

37 Loss of humus by burning.

1952 Marshall Ds.

38 Consequent loss of fixed K.

39 Compaction of soil by traffic.

40 Partial cementation of exposed layers.

~~1~~ Cinching of bare materials by repetition.

~~2~~ Piling of vegetal matter from not readily available in organic material - plant & animal bodies, humus, etc

~~3~~ Compaction of soil by traffic.

~~4~~ Partial cementation of layers.

~~5~~ Oxidation of organic exposed to air.

~~6~~ Evaporation of water from surface.

~~7~~ Extraction of water by roots.

~~8~~ Extraction of minerals by roots.

~~9~~ Oxidation and reduction of minerals

~~12~~ Binding of loose material by vegetation.

~~45~~ Binding of mineral matter in form not so readily washed out by rain in organic material - plant & animal bodies, humus, etc

~~52~~ Compaction of soil by traffic.

~~43~~ Partial cementation of exposed layers.

~~18~~ Oxidation of organic matter exposed to air.

19 Evaporation of water from surface.

20 Extraction of water ~~air~~ by roots.

21 Extraction of minerals by roots.

22 Addition and weathering of fertilizer phosphate.

~~18~~ Breaking down of [illegible] by [illegible] of [illegible] [illegible] under [illegible]

~~19~~ Formation of humus peat

~~20~~ Disappearance of [illegible] peat [illegible]

~~21~~ Conversion of sand [illegible] peat and [illegible]

~~20~~ Removal of carbonate [illegible] by [illegible]

~~21~~ Removal of [illegible] formed [illegible] by the [illegible]

~~22~~ Removal of phosphate in [illegible]

~~23~~ Reduction of phosphate [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

~~24~~ composting of tar pits.

~~27~~ Much formation in bottom of tar pits.

~~28~~ Stirring up of surface layers by children and boys

42

45

46

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41

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Soil process

✓8 Particles in suspension settle out of the water when velocity of stream is reduced

✓9 Cutting and filling of soil by wind, the velocity of wind being reduced by the presence of the water, land

✓2 Solution of material by wind, the commonly dissolved substances being selected

✓1 Deposition of material by water

✓3 Removal of material by wind.

✓4 Removal of material by stream action.

✓5 Solution of soil from spray and wave

✓13 Solution of bottom from wave action forward

✓14 Solution of from more from land, bluffs and earthen cliffs of gravel

1952 Marshall Ds.

38 Consequent loss of fixed N.

39 Compaction of soil by traffic.

40 Partial cementation of exposed layers.

March 18 - Wotho Islet -

Vial 135 - bottom layer - beetles found eating holes in overripe fallen breadfruit (Wotho I. Mar. 18).

#135 (cont) top layer - fly, mosquito and cricket found in forest, Kabben I. Mar. 20.

34423

3 in surface layer of beach sandstone between tides

green layer.

3 24 on surface of base of old coconut root crown (sample 114)

black

Sample #114 - pieces of peat-like remains of old coconut root crown - for comparison with samples #105 + 106, to be sure that these are not also remains of such old root crowns.

Along inside of windward reef, south of Wotho Islet, and particularly south of the long sand islet south of it, were some of the "oil streaks" described from Ujae. Most seemed quite broken up by wind but several were very strong. Some were noticed inside of open reef, some inside the solid islet. There were nowhere as many as commonly in Ujae.

March 19 - Enichenudo Islet

34425 open also
3 discolored beach conglomerate, about high tide level on seaward side, south end.

3 26 Auricularia
on dead Ochrosia trunk

Vial 136 - insects and spiders - ab weavers in brush and woods; yellow ants and black ants from two colonies in dead Messerschmidia ~~stump~~ trunk, each in separate stub, but within 1 dm. ~~Esp~~ larvae, etc. go with the black ones.

March 19 - Eirelu Islet

4 27 Cordia subcordata Lam.
large spreading, twisted tree, many trunks, forming a thicket all by itself, on low sand dunes.

2 28 Auricularia
on rotting Messerschmidia log in mixed scrub forest.

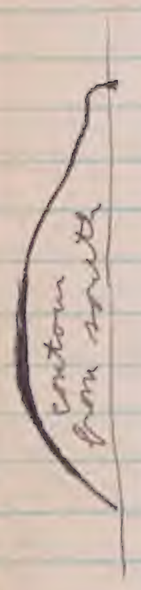
3 29
on rotting Messerschmidia log in mixed scrub forest

Sample # 115 - polished sand from ~~beach~~ south passage beach at about high tide level.

Bag. 120 - dirt + seeds from Wotho Atoll, mostly from Eirelu Islet, where, for some reason, they were infinitely more common than on other islets.

8 March 19 - Ombelim Islet

Land platform, somewhat uneven surface, 1.5-2 m. above h.t. covered by a single large grove of Pisonia, medium sized (perhaps 15 m. tall) with undergrowth of root sprouts of Pisonia (about 1 m. tall forming definite layer). This surrounded on all but southwest side by a narrow belt of Messerschmidia (at top of beach). Only other vascular plant is Heliotropium, which from a small patch on seaward side in ~~Messerschmidia~~ Tournefortia belt, now dry.



34430 Pisonia grandis R.Br.
6 Dominant tree, this one in Messerschmidia belt on lagoon side.

Peat layer well developed in central part only of Pisonia forest, from 1 to 3" thick, underlain by partially consolidated layer of sand, 1-2" thick, this lying on loose sand. On top is a loose layer of dry leaves covered by guano stains.
Sample #116 - peat from a rather thick place.
Sample #117 - partially cemented sand from beneath #116.

Near ~~for~~ center is a broad sand dune about 4 m. above high tide. Some sand is piled up around edges, burying lower parts of ~~Messerschmidia~~ Tournefortia trunks. Waves cutting a low cliff in sand on north side, exposing abundant ~~Messerschmidia~~ Tournefortia roots 4-5 m. from plants. Birds are abundant and the dead leaves, roots, branches, etc. are strongly stained by guano, but no noticeable accumulation of guano seen.

Shrub 2 m. tall (others trees up to 15 m.), completely defoliated (others in various stages of development of new leaves), loaded with fruit.

Sample 118 (2 bags) peat and partially cemented sand from place where peat is thin, has hard black surface.

Sample 119 - piece of a slab of somewhat weathered cemented sand lying on surface in central part of Pisonia forest. Possibly represents an older, now broken up layer of same cemented material from under peat.

March 19 - Kabben Islet

34431 Canavallia microcarpa (D.C.) Piper
7 abundant on lagoon side of coconut plantation that is much overgrown with brush and vines.

5 32 blue green
on open sand in sparse scattered scrub at west end

March 19 - Ombelem Islet

5 33 lichen
on bark near base of large Pisonia trunk

9 March 20 - ~~Kabben Islet~~ Bigen Islet
Land platform with high beaches, general surface about 2 m. above high tide level, but uneven, one large dune hill being about 2 m. above general surface. Lagoon beach being cut away by waves, leaving a 2 m. sand cliff, with a pile of slabs of beach-rock at base. One slab up in center of islet on sand.

4 34 Portulaca lutea Sol. ?
scattered tufts in coral sand under Pisonia trees.

extensive vine, tangled over shrubs and on ground; fruit immature.

forming a wrinkled crust.

9 Vegetation - rather open Pisonia forest in center, some fair sized trees, some bare, several still with last season's leaves. Occasional thin patches of Lepturus, scattered Boerhavia and Portulaca lutea, latter nearly leafless, the thick stems carrying it over. Sparse belt of Messerschmidia around periphery, with a few leaved bushes. Many white-capped noddy nests in trees. almost leafless, old fruiting branches dead, remaining leaves purple; stem dull brown, fleshy.

7 March 19-20 - Kabben Islet

A large triangular island with one lagoon coast and two seaward ones, an east and a southwest. There are also two passage beaches, one north, the other west, the latter not sharply marked off from southwest seaward beach.

Most of the beaches are of sand & fine white gravel. Along the lagoon beach is a broad ridge of sand, broken into small dunes at the western end. The north passage beach is of pebbles, lying on beach-rock, changing to finer gravel seaward and around on seaward beach changes to sand. Pebble beach is backed by a low ridge of boulders and cobble.

The south ~~point~~ peninsula of the islet is surrounded by a pebble-cobble beach, high and steep, backed by a very broad ridge of boulders and rubble, 100-200 m. wide. This beach rests on a pitted conglomerate platform with remnants of a higher platform here and there not yet completely eroded away on the southwest side. The

Vial #139 - animals collected in and under rotting Mezenschmidia log in mixed forest, Kabben I. March 20.

7 ridge and boulder beach extend around the point and ~~fo~~ to the beginning of the sparse scrub and the crescent of sand beach on the s. w. side and a corresponding distance, perhaps 300 m. or more, on the east side.

The southwest corner of the islet has a broad reef-rock platform, and three series of beach rock extend along the passage beach, dipping ~~down~~ away from the islet, splaying out fan-wise toward the lagoon corner, but not reaching it. This part has a sand beach.

Along the top of the lagoon beach is a narrow belt or fringe of scrub of Scaevola with some Mezenschmidia, tangled with Wedelia. This is in the edge of the coconut plantation, on the sand ridge.

(ctd. on p. 90)

March 20 - Kabben I. islet

34435 Cordia subcordata Lam.
4 large clump in mixed forest just in from lagoon beach - common in mixed forests around coasts of islet

1 36 Turbinaria ornata J. Ag. (det. Taylor 1955) dried fragments, bleached.
cast upon east seaward beach.

Sample #121 - drift seeds from Kabben I. Wotho atoll (note pentagonal Barringtonia fruit.)

Sample 122 - pumice from east beach, Kabben I. Wotho atoll

Sample 123 - peat from under Pisonia trees, central part Kabben I. islet. (from layer about 6" thick, loose below, many roots removed.)

Sample 124 - peat from same place as #123, but layer only 2-3" thick. Surface black.

Sample 125 - black crumbly soil with fine rubble from beneath #124. about 4-6" deep, on fine rubble.

large spreading tree; sterile.

7 Under large Pisonia trees near center of eastern half of island, is a well developed layer of spongy peat. In places sampled it varies from 2 to 6 inches thick. Surface is black and smooth under a loose thin layer of dead leaves. No noticeable guano. Peat is very dry. Inside it is brown. Many large living roots are in the layer.
Under it is simply loose blackish crumbly soil with much small rubble. No noticeable sign of either consolidation, cementing, or softening of rubble fragments.
~~(see samples 123-125)~~

March 21 - Mokemok Islet

3	4437	Caulerpa urvilliana Mont. (det. Taylor 1955) well below low tide level on smooth rock bottom of passage west of islet	rhizomes creeping, straight
3	38	Caulerpa urvilliana Mont. (det. Taylor 1955) epiphytic on Caulerpa #34437	reddish
6	39	Terminalia samoensis Rech. in sparse mixed scrub-forest	shrub 1 m. tall; flowers cream white.

March 21 - ~~south~~ north half of long ~~one~~ unnamed sand island on east reef

5	40	Terminalia samoensis Rech. occasional in sparse to closed scrub on sand dunes.	shrub 2.5 m. tall, one almost leafless, but covered with red fleshy terete fruit, other, same clump, sterile but with leave. seedlings on leeward side on soft sand.
3	41	Suriana maritima L. one very small colony on seaward side on low sand flat	shrub 1 m. tall, leaves bright green, flowers dried-up.
7	42	Pemphis acidula Forst. one small but very dense clump ~~on~~ on whole island	densely branched shrubs 4 m. tall; thin leaves on lagoon side, thick fleshy ones on windward; flowers white.
1	43	Halimeda bleached, washed up on beach	

March 21 -

Vial #137 - bottom layer - animals ~~insects~~ collected under loose bark of dead stub of Messerschmidia tree, north end of unnamed long sand spit on east reef.
second layer - small beetle, brushed off vegetation, Mokemok Islet, March 21.

Sample #126 - pumice. scattered over surface of bare sand on Mokemok Islet. (½ bags) (see p.77)

Vial #141 - Mokemok Islet - March 21, flies collected around large log cast up on beach, with masses of dead goose-neck barnacles which are possibly what attracted the flies.

Vial 138 - insects and spiders collected around large Pemphis acidula clumps on long unnamed sand spit on east reef. Many insects seen on shaded side of clumps (9-9:30 a.m.) none on sunny side.

March 22 - Wonbar Islet
East end surrounded by pebble & boulder beach, lagoon beach west of this, sand. Seaward beach, as seen from west, is a high steep boulder ridge.
Most of the islet is covered by dense Pisonia forest, reaching out to seaward edge. Surrounded, on lagoon side, by a broken fringe

March 22 - Medyaron Islet -
East passage beach, seen from east, very long. Outer third is boulder beach, middle third seems to be gravel, inner third sand. A well-developed belt of Messerschmidia extends along entire beach, backed by coconut plantation.
Lagoon beach is all sand. In the eastern part there is no very noticeable sand ridge. In the middle the sand ridge along ~~the~~ back

of ~~Messerschmidia~~ Tournefortia.
A clump of coconut at west end.

Seen only from boat in lagoon.

Sample #128 - drift seeds from Medyaron, Mokemok and sand spit on east reef.

of the beach is broad and low, but very definite, actually appearing to be two ridges. Westward about the west third of it develops into conspicuous dunes from 6 to 10 feet high. ~~Along~~ Back of lagoon beach is a broad belt of open scrub, of Scaevola, ~~Messerschmidia~~ Tournefortia, guettarda, occasional Pandanus and Suriana. Between them is open sand. On this are

10 scattered pumice and scoria pebbles with network of roots on under side. (~~Hamptons~~)
Here and there in this belt are great clumps of Calophyllum. Their leaves are browned on tips or edges where much exposed to weather.
On the dunes to the west the scrub is about the same composition as on the sand flats back of the beach to the east but with much more Suriana. In openings Tournefortia is often found, half smothered by sand. In other openings Leptarrus is common and Cassytha is common both on Leptarrus and on bushes.
To the west, near point the scrub becomes taller and denser, and may be termed scrub forest.
The island is extensively planted to coconuts, on a fine sandy gray-brown soil. The part of the plantation near the lagoon

10 beach is rather well cleared out, with scattered small bushes, the ground covered by a mat of Canavallia or Wedelia. Large Calophyllum trees are found around old house site and elsewhere where there might have been a house, just back from the beach scrub (Calophyllum is more abundant on this islet than anywhere I have been in the Marshalls. Probably this accounts for the abundance of Calophyllum drift seeds on the beaches of various islets of Wotho).
Away from the lagoon the woody second story becomes more abundant, forming thickets, composed of Pandanus, Morinda, Terminalia, Scaevola, a little Cordia, tangled with Ipomoea tuba and Canavallia, and choked

10 with coconut seedling of all ages. Walking is difficult. There is some ground cover of Polypodium and Asplenium the latter especially in small openings. In thin places in the plantation Tournefortia ~~Messerschmidia~~ and guettarda are very ~~abun~~ common, with Wedelia on the ground.

Natives visiting this islet had gathered a bundle of dry Pandanus leaves and some copra and turtle eggs, as well as 3 or 4 dozen coconut crabs. Some of these had been roasted and the large claws tasted very good. A ~~one~~ large individual from this batch was preserved - in tank of alcoholic specimens otherwise collected by MacNeil. (unnumbered). The color varied on different individuals, dull purple usually predominating, but certain ones largely light blue.

12 March 21 - Mokemok (Mokemok) Islet - Belt toward lagoon a sand flat, forming 2 parallel ridges, especially toward the west, where there are two more ridges, separated from the two lagoonward ones by an interval, in which there is locally a little rubble. These ridges are generally sandy.

On the sand flat a ~~and~~ two lagoonward ridges is a sparse stand of scrub of Scaevola, guettarda, and Tournefortia ~~Messerschmidia~~. Much bare sand and much cassytha on the bushes. Pumice (~~sample~~ #126) is scattered commonly on this sand. Some of the pieces have patches of a sort network on the bottom.

The rest of the island is wooded with a mixed forest, in most parts rather sparse, made up of Tournefortia ~~Messerschmidia~~, guettarda, Pisonia, Cordia,

12 and Scaevola, the ~~Messerschmidia~~ Tournefortia most abundant near the edges, the Pisonia almost dominant in center. Three sparse patches of coconuts are found near the lagoon side. They show evidence of the drought in having the recent clusters of nuts dwarfed or abortive, some nuts small on some of the older clusters. Trees in the westernmost clump mostly have no nuts. The forest is rather dense in center of widest part of island, where Pisonia is commonest, about 7-10 m. tall, little undergrowth or ground cover. To the west it thins out, becomes rather sparse, ~~Messerschmidia~~ Tournefortia more abundant, Pisonia less, thin ground cover of Lepturus with some Boerhavia, Cassytha especially in open places. One can walk freely almost anywhere. More or less same on

12 east end near passage beach. Some Terminalia here.

The low rounded mounds of broken coral perhaps betray their origin here. A little to seaward of center of islet, where the soil is generally rather rubbly, low mounds of small pieces have piled up around root systems of Pisonia trees, either surrounding them or on the seaward side. In a few cases the tree has fallen, leaving the mound, with the tipped up root system adjacent, lying toward the lagoon either contiguous or several feet away. There are examples in various states of preservation, one or two having sent up big sprouts from the fallen trunks, one having almost decayed away, and several lacking any root system, the mound alone surviving.

around the peninsula that sticks out to seaward from near the lagoon end of the east passage beach around to the urgent bend in the west passage beach, is a well developed boulder ridge, with heavola - Messerschmidtia scrub on the north east side, this changing inward to the forest described above.

Back of the west end are several channels between rubble a reef conglomerate flats. Water runs swiftly through these from seaward, where they are narrow. They are much wider toward the islet, then the current sweeps westward from each of them around the west horn of the islet.

In these the "oil streaks" described before were very prominent, following the direction of the wind rather than that of the current, though they are not very different. Opportunity was taken to

examine these carefully. No iridescence whatever was noted. The boundaries are extremely sharp. The phenomenon is one, certainly, of a much increased surface tension. There was a suggestion of difference in feel of the water, but not very tangible. No difference in taste. Attempt was made to follow several of these streaks to their sources, which seemed to be in the rubble flat to windward, but the appearance finally gradually disappeared as the source was approached. (MacNeil reports seeing small emissions of bubbles coming out of reefs in places). No origin obvious. Material did not seem to have come in from the sea, though this was not impossible here.

B Sarcocaulon

3 Mar. 21 - Long unnamed sand spit on east reef. Examined north third of this.

The spit is a long low ridge of sand on platform that is generally marked with several series of beach rock, that showing along lagoon beach mostly dipping toward lagoon, that on seaward flat of reef conglomerate mostly dipping seaward. However, one stretch of a single series of beds, lying between the seaward dipping beds and the main sand ridge dipps lagoonward, making it look as though a stretch of the sand ridge has moved into the lagoon. The denuded outer flats are generally rather wide.

There is very little vegetation, only a few scattered Terminalia ~~Messerschmidia~~ and Scaevola bushes, on the thin

3 sand locally found on these seaward flats. On the main sand ridge is a mixture of Scaevola, ~~Messerschmidia~~ Tournefortia and Terminalia, varying in density from scattered to continuous, some ~~Messerschmidia~~ Tournefortia trees 5-6 m. high and 2-3 dm. thick, but these uncommon.

Where there are scattered bushes low mounds of sand have accumulated ~~between the~~ under them. Where there is continuous scrub the sand ridge is continuously several feet higher, with highest line usually nearest the lagoon side.

On seaward side is one tiny patch of Fumana, and about one third the way from the north end is a large and conspicuous clump of Pemphis acidula, quite dense. On the lagoon side the leaves

3 are rather thin, on the seaward side very thick. At 9-9:30 a.m. insects of various sorts were common on the west side of this clump (~~see Bottle 130, p. 21~~) while none were seen on the sunny side. The Pemphis was flowering.

The sand where there is no vegetation tends to be flat on top. It is fine, white to pinkish, and the surface may be held firm by an incipient algal crust. There is a loose layer of dead leaves under the bushes. Here and there are thin patches of Lepturus in the bushy vegetation, none in open.

There is a small group of ragged coconut trees at north end, and a very few ragged individual trees here and there along the islet.

From the lagoon the vegetation all along seems to be scrub with frequent ~~Messerschmidia~~ Tournefortia 2-3 times as high as general level of scrub.

3 North of this spit are some small patches of sand on the reef. Then there is a small islet with two patches of vegetation connected by a rock flat. The vegetation of both halves is sparse scrub and there is one coconut tree on south half. (Seen only from boat).

Between this and the south end of Wotho Islet is a small bar on a rock platform. From a boat two bushes are visible on this.

2 March 19 - Wotho Islet -

The grass, and, especially, the ~~fo~~ Fimbristylis, show strongly the effect of the drought, by being brown and partly dried up.

Beach rock, dipping lagoonward, extends for some distance along south end of lagoon beach. It is pitted with rounded edges, probably abraded by wave-washed sand.

Toward the south end

3 ~~th~~ perhaps 200-300 m. north of point, there is an abrupt change in the height of the coconut trees, those to the south being lower. The south point has only mixed scrub and, back from point, mixed scrub forest.

Bokewaki

March 18 - South of the long sand spit and to the lee of it, "oil streaks" were observed, not very numerous, but a few of them very distinct. Those to leeward of the sand spit would seem to preclude the idea that oil was coming over the reef from the open sea. Also common on both sides of Erotjeman!

Erotjeman

Legiwa

4 Ruswaa Islet - seen only from boat in lagoon. On lagoon side appear to be high rock beds, possibly undercut by lagoon waves, extending above all but most extreme high tides.

Vegetation is a sparse scrub and scrub forest

4 mostly of ~~Messerschmidia~~ Tournefortia with some heaerola, a few coconuts on lagoon side.

Erotjeman Uditj

5 Erotjeman, Uditj and Jabenau Islets - seen only from ~~lagoon~~ Tubular boat in lagoon. These are all wooded possibly mostly with Pisonia, as defoliation is very noticeable, but from appearance on aerial photos, rather mixed. The ends, and in case of ~~Jabenau~~ Erotjeman, the seaward projection tapers off to scrub. On ~~Jabenau~~ Erotjeman MacNeil reports a single Pemphis bush on extreme end of seaward projection, the rest of the scrub being ~~Messerschmidia~~ Tournefortia and heaerola. This projection is bare rock.

On each of these islets there is a small patch of coconuts on the lagoon side.

On Erotjeman the lagoon beach is lined with beach rock with great slabs of it piled up on beach or about some sand in north end, this with strut of ~~Messerschmidia~~ Tournefortia and heaerola.

Erotjeman

Lagoon side of Erotjeman mixed forest of Pisonia, Messerschmidia, Guettarda.

March 19 - Enjebi (Enjebelto)

The entire lagoon beach, except for a few short stretches, is lined by lagoonward dipping beach-rock, and above this, great slabs of beach rock are piled up to the top of the beach. The unusually strong lagoon waves are dissolving the beach-rock along bedding planes, cracks, etc. the cracks apparently result of undercutting along bedding planes.

A slight ridge is developed here and there along lagoon beach, but it is not conspicuous.

Along the entire lagoon beach, except for a short stretch of coconuts with Scaevola between them, is a mixed forest of Guettarda, ~~Messerschmidia~~ (Tournefortia), Pandanus, Pisonia, ~~Ochrosia~~ (Neisosperma) and Scaevola, tangled with ~~Wedelia~~ (Wedelia) and Ipomoea pes-caprae. Here and there are small patches of Leptarus.

Inward Pisonia becomes dominant, but is being

replaced by a vigorous layer of young ~~Ochrosia~~ (Neisosperma) trees.

In the center, at least of the south end, is a solid forest of ~~Ochrosia~~ (Neisosperma). In all of this forest sticks blackened by Xylaria are common. Rats are common.

The soil in the forest is fine and blackish, ~~gritty~~ with varying ~~quantity~~ admixture of fine rubble.

Toward the seaward beach it becomes more sandy and has on the surface boulders strewn into the forest.

~~In~~ The south end is mixed forest similar to that described for the lagoon beach, with also some Canavalia tangled in it. This peters out into mixed scrub on the sandy extreme south end.

The entire seaward beach is gravel, resting on flat reef conglomerate. Above it is a belt of ~~Messerschmidia~~ (Tournefortia) forest with a Scaevola fringe.

7 Kabben Islet (ctd. from p. 65)
The plantation, except immediately around the old hut, is choked with thickets. Near the lagoon these thickets are of Pandanus, Scaevola and Morinda, tangled with Wedelia. Around the hut, where the thickets have been cleared, a thin tangled mat of Wedelia covers the ground.

West of the center of the lagoon beach, Pisonia becomes a component of the plantation thickets, Osbornia locally forming almost pure stands. From here westward the coconuts are very sparse, thickets dense.

with guettarda and Pandanus making up undergrowth.

Back from the beach, in the region of the hut, Scaevola rapidly drops out. Guettarda, Morinda and Pandanus dominate the thickets and the whole becomes choked with young coconuts of all ages.

Still further back the coconuts become sparse. They are large clumps of breadfruit, and Osbornia becomes common.

7 Westward the plantation gradually changes to mixed scrub forest with a few coconuts. On the west end, behind the low dunes, there is open sand with a scattered scrub of Scaevola, Guettarda, Suriana, and Messerschmidia, with scattered trees of Pandanus and small coconut trees. On the sand is a well-developed algal crust.

On the north passage a belt of scrub, mostly Scaevola and very low on the seaward end, becoming mixed with Messerschmidia and Guettarda, and taller toward lagoon, occupies the ridge of broken coral. Back of this is a scrub forest of Messerschmidia, Pandanus, Pisonia, Guettarda, Soulamea, with a little Scaevola and Terminalia. Locally there is a ground cover of rather wilted Polypodium, and of Soulamea seedlings, these now mostly dead. A few saplings of the trees and a tangle of Wedelia

7 make up the undergrowth. In openings Lepturus and Triumfetta ~~are~~ form the ground cover. The soil is small rubble, becoming finer inward.

Toward the edge of the plantation a few scattered coconuts, Cordia, Morinda and Allophyllus are added to the scrub forest. The forest is generally not more than 10 m. high, the canopy not dense, at least in the dry season. The undergrowth becomes thicker by addition of coconut seedlings. ~~Cordia~~ Vegetation becomes more luxuriant. Conditions become slightly moister so that seedlings of Boulamea are able to survive. Probably this change to slightly moister conditions is due to lessened penetration of wind due to greater distance from the windward beach.

7 Inward from the east end of the lagoon beach, into ~~the~~ sparse coconut plantation grown up to a scrub forest. Pisonia, Guettarda, clumps of Cordia, with Canavallia festooning everything. In a little way are several Breadfruit trees, coconuts become scarce. Locally Pisonia is dominant and makes very large trees. Under them is a well developed peat layer (samples 122-125) and no undergrowth. The soil of fine rubble soon becomes mixed with much ~~fine~~ dark gray-brown loam. This mixture is generally at least 3-4 dm. deep, the rubble increasing downward.

Boulamea becomes common and further in, abundant. Guettarda is co-dominant with it, and ~~Ochrosia~~ Neonauclea appears, forming local patches. Toward these patches become more frequent and larger, until the large area of pure ~~Ochrosia~~ Neonauclea

7 forest extending inward from the east coast is reached. The soil remains the same uneven mixture of loam and fine rubble. In the mixed forest around the pure Ochrosia ~~Wedelia~~ Wedelia wilcoxstones behaves as a liana, straight stems going up into the canopy, then forming tangles.

Extending from the east coast in for some distance is a great roughly triangular area of pure ~~Ochrosia~~ Neisosperma forest. This has a ~~[illegible]~~ layer of fruits on the ground and a continuous layer of seedling, varying locally in height from 2 dm. to 1 m. The height of the forest varies from perhaps 20 m. ~~down~~ sloping down to the east to perhaps 4-5 m. then it gives way to a narrow belt of scrub, mainly Scaevola, which lines the beach. There is some admixture of Guettarda and locally clumps of ~~Tournefortia~~ Tournefortia trees. A characteristic of this scrub belt on the windward beach is the effect

7 of strong grooves or channels in the surface of the vegetation, parallel to the wind direction, starting at the beach and becoming shallower and disappearing inward. This scrub belt extends the full length of the east coast, typically wedge shaped in cross section, thin edge to the beach.

Along the inner side of the ~~Ochrosia~~ Neisosperma forest great Pisonia trees are mixed with the ~~Ochrosia~~ Neisosperma. Here also, are many patches where the Ochrosia is very chlorotic, and even some trees have died.

Just inland from the ~~Ochrosia~~ Neisosperma forest is a mixed forest of great Pisonia trees, a Ochrosia and a few old ~~Messerschmidia~~ Tournefortia trees, a few Pandanus and small Allophyllus. Undergrowth is of saplings of ~~Ochrosia~~ Neisosperma and a few of Allophyllus. There are occasional scattered

7 groups of the low rounded mounds of broken coral previously described. One old Tournefortia ~~Messerschmidia~~ had fallen. Paced off it was about 45 m. tall. A few of the Neonauclea ~~Ochrosia~~ here are old, but there is mainly a stratum of young ones about 10 m. tall. The undergrowth is of young Neonauclea ~~Ochrosia~~ saplings and a few young Pandanus.

Northward near center of this part of the island is a sparse stand of coconuts choked with Guettarda, Neonauclea ~~Ochrosia~~, Pandanus etc. with seedlings of these and of coconuts making walking difficult.

Then there is a section of scrub forest of Guettarda, Scaevola, Pisonia, and Pandanus.

Between this and the east end of the lagoon beach is more choked coconut plantation.

7 The east coast scrub belt sends a narrow hook around the south point. This is backed by mixed forest, the transition being gradual, Guettarda and Tournefortia ~~Messerschmidia~~ replacing more and more of the Scaevola.

Along the boulder beach of the southwest coast of the south peninsula mixed forest comes right to the top of the beach. It is made up of Pisonia, Tournefortia ~~Messerschmidia~~, Guettarda, and Cordia.

Inland on the broad boulder flat Pisonia becomes dominant in this mixed forest, some of the trees being enormous. Inland from these is a large opening on the rubble flat filled with a deep mat of Wedelia ~~Wedelia~~. In the inner edge of this is a grove of coconuts.

The boulder and rubble flat along this coast is 100-200 m. wide.

Along the central part

7 of the southwest side is a wide sand flat with very sparse scrub, much open sand, heaerola predominant.
In the mixed forest on the rubble and boulder flat there is little undergrowth except occasional seedlings of the component trees and, inland, of ~~Cohnosia~~ Messerschmidia which is rare as a large tree but is actively invading.
The Cordias, abundant near the beach, are enormous low spreading trees with immense gnarled trunks and great writhing horizontal branches just off the ground. Penetration difficult.

8 March 20 - Eirek Islet
The surface of this islet is all sand. Along the lagoon beach is a broad dune ridge from 2 to 4 m. above high tide level. The seaward part is lower.
On top of a high rounded dune on the south end ~~is~~ are scattered large boulders, about 2.5 - 3 m. above high tide. On this dune there is a grove of Pisonia, surrounded by ~~Messerschmidia~~ Tournefortia and Terminalia. Both the Pisonia and the Terminalia were practically leafless. North of this a large Cordia forms a broad low tangled thicket.
In the center are three patches of coconuts, the middle one back from the beach. Between them is a patch of ~~Cohnosia~~ Messerschmidia. Here there are, for a short distance, two dune ridges, but they are lower than at the two ends. The west ~~north~~ end and parts of

8 the ~~south~~ east and center are covered by a mixed forest of ~~Messerschmidia~~ Tournefortia, Pisonia, Terminalia, and Guettarda. The edges of this and sparser spots are tangled with ~~Wedelia~~ Wollastonia. Some of the Terminalia has lost its leaves, some has not.

The lower ground back of the dune ridge is covered by uneven scrub forest, mainly Messerschmidia, Guettarda, and Pisonia, of ~~no~~ varying density. Toward the seaward beach, especially on the ~~south~~ east and ~~north~~ west ends, this thins out to a sparse scrub of Scaevola with some ~~Messerschmidia~~ Tournefortia and some Guettarda. Much bare sand between the rounded bushes.

A broad series of beach-rock, dipping seaward, lines the southeast beach. Some beachrock, also, on the south side, and along the southwest side

8 Drift seeds are unusually abundant on this island.

The sand at about high tide level, and the beach sandstone beneath it are curiously polished. (sample 9.5, p. 58).

13 Wotho Birds:-
In general, birds are abundant on the smaller islets, relatively scarce on the larger ones. Nesting is mostly seen on the smaller islets. Terns, as usual, are the most abundant birds.

Frigate birds -
a colony of well over a hundred roost on Ombelim Islet. During the hot part of the day they are mainly resting, toward evening they soar in numbers above this and other islets, or out over the sea. Several individuals are all black beneath. Some also seen over Bigen Islet.

Terns - Both noddies, fairy terns, and rarely ~~black-napped~~ black-napped terns may be found fishing together, flying excitedly over ~~schools~~ of fish, diving for them either in lagoon or out on open sea. After they are full the noddies rest in the water.

13 Brown booby -
One seen several times around Bigen Islet. An immature one seen at sea west of Bigen. One adult seen at Ombelim I.

Common noddy -
Seen in small or moderate numbers over lagoon and at sea, a few on the larger islets. Many on Enicherudy Islet! Many birds and several nests seen on Eirelk I., with downy young. One bird scared up here that had difficulty flying because it had Pisonia fruits stuck over its feathers. Several nests on Bigen Islet. Many birds seen on the long sand spit on the east reef. Some birds and one nest on Mokremoks, this low in a Guettarda tree.
Commonly seen, in middle of day, in groups on beaches.

13 White-capped noddy –
Commonly seen fishing over lagoon or open sea, at any time of day. Some nests seen in Ochrosia trees on Enicherudo I., also about 20 nests on Eirik. Hundreds of nests and a multitude of birds on Ombelim, in Pisonia and also in Messerschmidia, many seen holding a "conference" in Messerschmidia trees on seaward side. On the seaward side of Kabben Islet were a small group of nests in Pisonia trees. Many nests in Pisonia and Messerschmidia on Bigen I.

Fairy terns –
To be seen generally almost anywhere, flying over lagoon or open sea in pairs or small groups, or fishing in flocks in company with other terns, or flying overhead or islets protesting intrusion into their privacy. Probably in most such cases there are eggs or

13 the bare branches of the trees, but they are seen only with difficulty. Many seen on Ombelim Islet, ~~[illegible]~~ where one egg was seen on a Messerschmidia branch. On Enicherudo many were flying overhead, protesting as though they had eggs in the trees. Many were flying over the long sand-spit on the east reef, also over Mokemok Islet.

also one half feathered and one fully feathered young.

Black-naped tern –
Small flocks on various islets, invariably on a over sand projection or beaches on inner corners of islets. On Eirik there were 8 on the east corner and 4 on the west. On Ombelim there were 10 birds on the inner beach – the island is too short for the corners to be distinguished. 6 were seen fishing over the lagoon near Wotho at 6.30 p.m. and

one with a flock of other terns near Maloelap at about 4 p.m.

13 Crested tern -
Rare here, possibly only one or two pairs. One seen at sea west of atoll. Two seen on Imbelim Islet.

Pacific Golden Plover.
Seen in small number generally, on inner and outer beaches, and in interior wherever conditions are at all open, on most islets. Often with turnstones, tattlers, or curlews.

13 Wandering tattler -
Seen one or two at a time, usually on outer beaches or reef flats, or passage beaches on most islets. Often in company of plovers or turnstones, or more rarely, curlews.

Turnstone -
In small flocks of two to five on most islets, on beaches or reef flats. Often with plovers and tattlers.

13 Bristle-thighed curlew - seen singly, in pairs, or as many as three or four on beaches and reef flats of most islets. Here often fairly tame, allowing one to approach to within 15 or 20 m. before flying.

Whimbrel - Rare. One seen on Enewetak Islet.

1952 Marshall Is.

Itinerary of voyage -
from Capt. M.W. Chapf's log book
of 75367.

Left Yokohama		Nov.	16	13:51
Arr.	Taongi atoll	"	25	06:30
Dep.	Taongi atoll	"	25	16:00
Arr.	Bikar	"	26	09:30
Dep.	"	"	26	11:30
Arr.	Utirik	"	26	17:30
Dep.	Utirik	"	28	12:30
Arr	Kwaj	"	29	10:00
Dep.	Kwaj	"	Dec. 1	16:00
Arr.	Utirik	"	2	15:00
Dep.	Utirik	"	4	14:00
Arr.	Taka	"	4	15:30
Dep.	Taka	"	9	12:00
Arr.	Utirik	"	9	13:15
Dep.	Utirik	"	10	10:30
Arr.	Ailuk	"	10	15:30
Dep.	Ailuk	"	11	08:15
Arr.	Likiep	"	11	13:15
Dep.	Likiep	"	18	09:00
Arr.	Jemo	"	18	11:00
Dep.	Jemo	"	18	14:00
Arr.	Likiep	"	18	17:00
Dep.	Likiep	"	23	08:30
Arr.	Jemo	"	23	13:30
Dep.	Jemo	"	23	15:00
Arr.	Ailuk	"	23	18:00
Dep.	Ailuk	"	Jan. 4	08:45
Arr.	Lae	"	5	09:30

Dep.	Lae atoll	Jan.	5	20:30
Arr.	Kwaj	"	6	08:15
Dep.	Kwaj	Feb.	1	16:00
Arr.	Ujelang	"	3	10:00
Dep.	Ujelang	"	10	16:30
Arr.	Wotho	"	12	09:00
Dep.	Wotho	"	16	02:30
Arr.	Ujae	"	16	09:15
Dep.	Ujae	"	24	21:30
Arr.	Kwaj	"	25	10:00
Dep.	Kwaj	Mar.	1	07:30
Arr.	Ujae	"	1	18:30
Dep.	Ujae	"	14	20:00
Arr.	Kwaj	"	15	09:30
Dep.	Kwaj	"	17	19:00
Arr.	Wotho	"	18	10:00
Dep.	Wotho	"	23	07:30
Arr.	Bikar	"	24	[illegible]:30
Dep.	Bikar	"	24	18:30
Arr.	Taongi	"	25	9:00
Dep.	Taongi	"	25	21:00
Arr.	Kwaj	"	27	10:30
Dep.	Kwaj	Mar.	31	3:15
Arr.	Guam I.	"	"	10:30
Dep.	Guam I.	Apr.	2	8:00
Arr.	Tokyo	"	7	5:00

March 24 - Bikar atoll
from ship at from 1/4 to 1/2 mile.

Passage at 10:30 a.m. - low tide, quiet water outside, entire reef showing, edges of passage out of water, conspicuously undercut. Strong current flowing out + 2000 rpm of penyan boat ~~go~~ engine just held boat in place.

at 3:30 p.m. half tide - no noticeable current, but small swells across mouth of passage cause tide-rip and considerable turbulence, suggesting some current. Wind waves from inside may have caused some of the turbulence.

at 6:30 p.m. - high tide - a going down somewhat - tremendous current coming out, making a wake a couple of hundred yards out to sea. Great swells breaking across. Between swells the channel like a mill race.

Leeward reef has numerous boulders strewn over it.
Windward reef, north of islets, has a few, but larger.
North part of reef flat very wide, a sand bar on inner edge.

Tall bibbs

Jaborukku Islet - covered by tall Pisonia forest, trees partly defoliated. A second layer 2/3 - 3/4 height of canopy, much greener, unidentified, slopes off to windward into scrub. May also be Pisonia. A sparse fringe of Messerschmidia along both inner and outer beaches. One greener clump possibly Guettarda.

Tall bibbs

Between Jaborukku and Arumenii islets a more or less continuous sand and rubble flat a wide platform. Of this highest parts a very few young Messerschmidia.

Aruemeni Islet - on northern projection a sparse stand of Messerschmidia. Main part of islet a Pisonia forest with sparse fringe of Messerschmidia around edges. Some small sand dunes on south side.

Jaboerā Islet - an unvegetated sand bar held by beach rock on seaward side.

Bikar Islet: Mostly tall Pisonia forest, with a belt of very sparse scrub around it, especially on north and south ends. Scrub mostly Messerschmidia, a very few heavols bushes. Several coconut trees in outer part, a large grove of them on inner end, between forest and scrub belt. Dunes on south side. On south side some enormous boulders on beach.

"Oil streaks" numerous to lee of south half of atoll - rather braided and broken up at bet. 1/4 & 1/2 mile, but some still fairly strong.

Birds -

Very few birds seen on leeward side of atoll - only a few brown boobies.

On north, east, and south, larger number of boobies, brown, red-footed, and a few blue-faced, fishing with some noddies (common?) and a few fairy terns.

Great numbers of boobies, also many frigate birds roosting in trees on islets - scared up in great swarms by whistle blasts from ship at half mile.

Two unidentified fairly large gray terns seen flying.

The backs of brown boobies are sooty-brown, rather than chocolate brown as described by Mayr. Immatures rather gray-brown on backs. Two of these made passes at flag fluttering from masthead. Also dives for fish here trolling behind ship.

March 25 - Cruised around ~~a~~ atoll, sometimes within 1/4 mile.

Vial 140 - parasitic insects taken off of Sula leucogaster caught on fishline 1/4 to 1/2 mile off Kamome Islet.

Near the northern end of the leeward reef, mostly opposite a reentrant angle in the reef, ~~as~~ is a group of great boulders on the reef, 2 m. or more high, one, at least, several times as long, tending to be mushroom shaped because of a prominent nip. ~~The~~ Some are tipped over. On windward side many small ones.

"Oil streaks" such as described for Ujae, Woths, Bikar, are conspicuous on leeward side of leeward reef, especially in the neighborhood of the passage. Extend for several miles, becoming very diffused.

All of the vegetated islets have boulder & cobble seaward beaches, material becoming finer southwestward. Large boulders strewn on reef and beach and up on islands.

Three northern-most islets have ~~many~~ sparse grayish scrub of Messerschmidia, innumerable birds. Vegetation on seaward side of Sibylla Islet not so sparse, mainly of low Messerschmidia, some scattered Scaevola. ~~On Pokak Islet~~ Some areas where passages have filled, or perhaps vegetation has been swept off by storms, colonization is taking place.

Some Messerschmidia very dry looking, dead or appearing so.

On Pokak Islet there is more Scaevola. Also some taller trees here, probably all Messerschmidia, but possibly a few Pisonia.

Pokak

South Islet absolutely bare of vegetation. Mostly cobbly, locally gravel, great boulders strewn about.

The passage at low tide, much like a mill-race. Water rushing out, current showing well out from mouth.

At almost high tide not much current. However, west swell had set in and breakers stretched across mouth. On day without swell this would be time to enter. Even with swell, periods of quiet observed as much as 10 minutes.

In neighborhood (1½ mi. radius) of mouth of passage a peculiar lighter, blue ~~colb~~ color, suggesting effect of colloidal $CaCO_3$ in marl pools. Possibly fine $CaCO_3$ sediment coming out of lagoon.

Birds –

One black-footed albatross seen ~~fa~~ by Ch. Frey, on arrival in morning.

A large shearwater observed in flock at north point, sitting on water, and in numbers at various points flying. May be white-faced shearwater, but identity not certain. Dark sooty-brown above, white beneath but with wing primaries and secondaries, front edge of wing, and tail black. Same with black smudged somewhat beneath also.

no white seen on head above beak.

A smaller, but still large, black petrel or shearwater seen, not identified, flying close to waves on windward side in company with the other one.

Up to 8 or 10 frigate birds at a time following ship.

1952 Marshall Is
Pohnpei Atoll

All three boobies present, the brown in large number, the immature ones, especially, following the ship and diving at trolling lures, several getting caught. (collected parasites off of one. They bite vigorously) Blue faced and red footed in smaller number observed flying or fishing.

Sooty terns common flying around, sometime fishing.

A few fairy terns flying.

Two white reef herons flew out from reef, at different points, to ship, then flew back. One of these from near northern tip of atoll.

Fairy terns, sooty terns, brown boobies, blue faced boobies, and frigate birds, seen fishing together.

~~Pohnpei Atoll~~
Kwajalein Atoll

plants seen but not collected.
Terminalia catappa
Pedilanthus tithymaloides
Gossipium
Bougainvillea ?
Pithecellobium dulce ?
Cocoloba uvifera
Pseuderanthemum atropurpureum
Cissus pedunculatum

March 31 - Guam -
Much of forest on plateau at north end looks very decadent - large trees drying back. Forests on terraces below cliff-top on east side, n. e. of Mt. Santa Rosa and on north side, at Tulague, are green and healthy-looking.
Around Mt. Santa Rosa are areas, just inside contact of volcanics with limestone, are wet depressions with standing water in rainy season, and places where water disappears under the limestone.
In quarry just north east of east of Anderson Field pieces of limestone showing numerous Halimeda fragments were found.
Toward sea from this quarry is a very pronounced rim or wall at top of cliff, perhaps 6 - 8 m high. A hole has been blasted through this, giving an excellent view of the terraces below. On the face

of the cliff, just north of the hole, is a low grayish dense brush that I could not identify from distance, even with binoculars.
From air, it was possible to see dense growth of coconut seedlings around coconut trees in some areas on northern part of island.

April 1 - Guam -
Road down to Apra Harbor from Com-Marianas - Casuarina quite luxuriant, especially on road-cut, and less so away on sword-grass slopes. Some of these rather densely covered.
Road across from Base 18 to Talofofo - scattered Casuarina on most sword-grass areas. Some recently burned over north of road.
Fena River Dam area - Brookhart says most of forested area in valley bottom and lower slopes, as well as the belt across upper slopes of Fena drainage are on limestone

a debris strongly contaminated by limestone. Good stands of Cananga odorata observed on limestone slopes.

Extensive burning observed in Merizo area. Where not burned, Casuarina common on sand-grass slopes.

Rocks denuded by 1949 typhoon, south of Inarajan, fairly well covered by Ficus Pemphis. Breadfruit trees that were, in Jan. 1950, denuded of leaves and small branches, now look almost normal again.

Coconut groves east of Merizo show very few effects of typhoon, and mangrove swamps show none at all, except lack of large trees. Not examined very carefully. In coconut groves there is now considerable undergrowth and well grown banana planting.

In general, driving around coast road, if one did not know there had been a typhoon and did not look especially for evidences,

one might not realize there had been one.

Padina is common on bottom at moderate depths off south end - up to 10 m. Considerable other algal growth at such depths. No Halimeda seen.

Large "vegetation" of soft coral in 1-2 m. of water in "lagoon at s end.

Kodachromes, taken by Brookhart, of Uracas, just after eruption in early 1952, show no vegetation on the cone or the lava flows. On the two old remnants of a former caldera that still exist at the edge there is green vegetation - possibly grass or heaeola. Brookhart confirms that there was not a bit of green visible anywhere else on island, and that this vegetation was of very low stature.

April 2 - Around air field -
Weedy ground of a yellowish brown ash or tuff, immediately surrounding air base and field. On rough ground and that not affected by traffic is a dense scrub of Leucaena glauca with occasional bushes of Trema orientalis v. argentea. This scrub is from one to three or four m. tall. Occasional plants of Acacia confusa in it.
Isthmus of black ash, mostly grassland with bunches of a large grass - Miscanthus?; ~~and~~ scrub in rough places, bright green so not that noted above. Some bare ash or with sparse Canavallia.
Furabachi has patches of scrub, probably Leucaena. patches of bare ash

34444 Emilia javanica (Burm.) Rob.
2 occasional around air base
2 45 Phyllanthus urinaria
rare around airbase

Weeds observed immediately around air base:

* Cynodon dactylon
* Tridax procumbens
* Leucaena glauca
* Lida rhombifolia
Crotalaria mucronata
Solanum nigrum
† Ricinus communis
* Euphorbia hirta
~~† Phyllanthus~~
Vernonia cinerea
* Chloris inflata
✓ Sonchus sp.
Cyperus javanicus
Digitaria pruriens ?
Euphorbia thymifolia
† Oxalis corniculata ?
† Euphorbia heterophylla
Emilia javanica
Commelina sp.
Canavallia sp.
† Achyranthes aspera ?
✓ † Cassia leschenaultiana
✓ † Tricholaena repens
† Agave sisalana
† Phyllanthus urinaria
✓ Cenchrus echinata

flowers bright red.

* abundant
+ uncommon
< unrecorded from Iwo
Acc. to Tsuyama

april 13 - Road from Kumagawa to Chichibu - On the flat plain west of Kumagawa are prosperous farms, raising vegetables, millet, wheat, and especially mulberries for silk culture. Rice is doubtless produced in quantity in season but is not evident at this time.

The method of culture of the mulberries is a stump sprout culture, with stumps a foot or two high, producing whip-like sprouts 1-2 yards long and very large leaves.

As one enters the mountains they rise rather abruptly and are covered by a low deciduous forest, a few m. tall, of mixed composition, apparently harvested by a coppicing system, as the trees are really clumps of stump sprouts. Scattered over this are widely separated evergreens and small clumps of evergreens. These become more prominent as one goes toward Chichibu.

There are many cherry trees as far as Nagatoro, and they are at their best today. In the lowlands below they have already lost most of their petals.

On bluffs and steep slopes are splashes of bright rose-purple, from masses of azaleas. It is a deciduous form with a wide open tube. These are especially prominent on a sharp ridge between Nagatoro and Chichibu where I took some photos.

April 13 - Road from Chichibu to

This has, basically, the same sort of vegetation as on the other road, but evergreens are more abundant, and in larger patches. A specie of Clethra (?) with pendent inflorescences is prominent in the coppice.

1952 Wake Island (atoll)

April 19 - talked to Mr. Schultz, pest-control man for CAA, who has been here ~~for a couple of~~ years and with Ruby Cox, nurse, also here for 15 months or so. The latter has some house plants in pots:

Scindapsus aureus
Cordyline terminalis
Dieffenbachia

growing outside, close to house:

Catharanthus roseus (luxuriant where sheltered)
Crinum
plants small, densely caespitose, very purple, not flowering, somewhat sheltered.

Ananas comosus.
crown growing in box of soil, somewhat sheltered.

Polyscias guilfoylei reached a couple of feet in calm season, then was cut back almost to ground by wind.

Sweet potatoes grew luxuriantly where sheltered, any part exposed to wind was cut off instantly. Bugs ate the tops too.

Casuarina equisetifolia
two saplings planted

behind wind breaks - one wind break fell down and that tree was almost killed. The grew a half meter in 6-8 months.

Three coconuts planted at same time, with different degrees of shelter, the more shaded one watered most. The most exposed is 2-3½ m. tall, the second about 1 m., the third 2 m.

Tomatoes said to do reasonably well.

Melons grow, but not well, fruit very small.

Three sp. of mosquitoes
Culex
Aedes aegypti
Aedes scutellaris or albopictus
were common, now rare because breeding places destroyed.

5 red billed Java sparrow or finches in captivity

Gambusia, introduced 4 years ago into a concrete reservoir, now abundant in brackish pools.

Flies now scarce, formerly abundant.

4 sp. rats formerly very abundant, swiftlins, now not common.

not flown

 1952 Wake Island (atoll)

April 20 – Wake Islet

Vial 141 – ants (Solenopsis) and cochineal scale, on root ~~[illegible]~~ crowns of Setaria verticillata.

Vial 142 – dermestid from a dead and dried tern on ground, lice from a young tern in pinfeather stage. Black ant (~~[illegible]~~) on floor in hotel.

Vial 143 – Odonate larva, and Gambusia (mosquito fish) from brackish water in bomb crater.

Vial 144 – skink (lizard) caught on ground in open place, fairly common.

Vial 145 – flies caught around garbage dump, grasshoppers in open grassy places, spiders around buildings. Larva in grassy spot.

Mr. Frederick Schultz
3919 Waialae Ave.
Honolulu 55, T.H.
(ph. 77086)
(present c/o CAA Wake I.)

formerly ~~and~~ chief Sanitation Division, Territorial Board of Health, T.H.

Now, temporarily, running pest control work in Wake I. for CAA.

Started – Feb. 14, 1951.
took 1 month to get started.
poisoned rats
emptied out mosquito breeding places.
cleaned up garbage pits

 1952 Wake Island (atoll)

april 20 – The entire atoll has been altered from the picture given by Bryan, who made his observations in the summer of 1923. Only in about three spots are there any noticeable number of trees that seem to date from pre-1941 time.

One of these is on the north leg of Wake Islet, west of the housing area. Here are large Pisonia trees, with some admixture of Cordia, little undergrowth. The trees show some "windshear" effect, and are only 8-10 m. tall. Trunks up to 8dm. diameter near base but mostly much smaller. The soil is of coral pebbles but locally the top layer show an accumulation of black peaty material, which, however, is quite friable. This area was relatively little torn up by military activities.

On the eastern side of the lagoon, between the housing area and the Pan Am compound are some areas of Messerschmidia that look as though they

are remnants of the pre war forest.

The remaining such area is on the southwest leg of the island, just east of the Trans Ocean compound, where there is a small area of large Messerschmidia trees which stand out when observed from the air. Just east and lagoonward from this is some large Pemphis that was probably a part of the original stand mentioned by Bryan.

Around the northeast corner of the lagoon are still the salling flats of fine sand, mentioned by Bryan, with Scaevola mats and especially inward, low tangles of Pemphis. This Pemphis is rather small and looks young, but possibly remains from the stand described by Bryan. If so, it has been altered somewhat, opened up in places, grown up much taller, in places, than what Bryan reports.

(see p. 142)

1952 Wake Island

April 20-21 – Wake ~~Island~~ Islet

coral gravel and sandy soil

3 34446 Amaranthus ~~gracilis~~ viridis L. — sprawling herb
around abandoned Japanese garden

2 47 Pluchea adnata — shrub 2 m. tall, fls. pale lavender.
dominant plant forming
scrub in denuded or open places

3 48 Nicotiana tabacum L. — herb 1.5' m. tall; limb of corolla bright pink.
rare around abandoned
Japanese garden

3 49 Ipomoea batatas L.
rare around abandoned
Japanese garden.

2 50 Cynodon?
~~rare~~ common locally around
old Japanese garden, mostly
dead at this time of year

3 51 Abutilon Indicum (L.) Sweet — shrub 1 m. tall,
one plant near old Japanese — flowers orange, faded
garden. — by 10 a.m.

2 52 Amaranthus ~~tricolor~~ dubius Mart. — not spiny
rare around old Japanese garden

3 53 Boerhavia diffusa L. — prostrate, mat forming,
common generally, especially — stems red, leaves dull
in open places (with 34454) — green above, white beneath,
— flowers pink.

3 54 Boerhavia — prostrate, mat forming,
common generally, especially — stems green, leaves green
in open places (with 34453) — above, white beneath,
— flowers white.

1 55 Euphorbia prostrata Ait. — prostrate, purplish.
rare in open gravel

2 56 Catharanthus roseus (L.) Don — flowers magenta.
rare in open places

34457		Fimbristylis cymosa R.Br. abundant on recently graded air strip border	
1	59	Eragrostis poaeoides Beauv. ex R. & S. rare along edge of air strip	
1	59	Eragrostis amabilis (L.) W. & A. along air strip	mostly dead.
1	60	Portulaca samoensis v. Poell. rare in open place.	prostrate, fleshy.
3	61	Lesuvium portulacastrum L. common generally on low saline places	prostrate, fleshy, leaves somewhat compressed, ~~stems~~, glossy; stems red; flowers rose pink.
3	62	Lepturus repens (Forst.) R. Br. common locally in open places. (Wilkes 9)	
2	63	Conyza bonariensis (L.) Cronquist rare along roadside. (Wilkes 9.)	
1	64	Sonchus oleraceus L. rare along roadside (Wilkes 9.)	flower yellow
2	65	Euphorbia hirta L. common around old buildings	
1	66	Ficus carica L. one plant around building	shrub x m., tall. fruiting abundantly.
3	67	Ficus religiosa Desf. one plant ~~on~~ around building	shrub x m. tall, steils.
2	68	Portulaca ~~o~~ lutea Rol. very common generally	stems gray, ascending, plant green, flowers 1.5-2 cm broad, yellow. stamens 25-30
5	69	Gossypium hirsutum var. religiosum (L.) Watt ~~(Forst.) Roxb.~~ occasional, especially around old Japanese installations.	sprawling shrub with elongate branches; flowers cream-yellow.

34470 Setaria verticillata (L.) Beauv.
3 very local, one patch in second growth.

2 71 Coccoloba uvifera L. — shrub 3 m. tall, spreading and tangled.
rare in second growth around old installation.

6 72 Pisonia grandis R.Br. — small tree, wood very soft; staminate flowers and fruits on same tree
common generally, dominant locally

3 73 Ipomoea pes-caprae (L.) Roth — prostrate, extensive, forming mats; flowers purple.
patches locally

3 74 Euphorbia heterophylla L.
very common everywhere in openings and bare places.

3 75 Enteromorpha
in bottom of intermittent ~~tide~~ draining pool, varying with tides, but inland.

3 76 Fimbrachne insularis (L.) Nees
very local, patches

3 77 Cenchrus echinatus L.
common generally in open places.

3 78 Fimbristylis cymosa R.Br. — dense tufts.
common generally, especially in open places.

3 79 algae — forming a dense floating mat.
common on brackish pools in bomb craters.

4 80 Cordia subcordata Lam. — tree 4 m. tall (others larger); trunks up to 1 dm or more thick). flowers bright orange.
subdominant locally in Pisonia forest

3	81	Portulaca oleracea L. common generally in open disturbed place	fleshy, spreading, purplish-red
4	82	Eleusine indica (L.) Gaertn. common generally around buildings	small spreading herb.
3	83	Sonchus oleraceus L. rare around dwellings.	erect, flowers pale yellow.

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varying between 1-3 m. tall, no large trunks seen. The Pemphis seems to grow on either fine silty sand or on broken coral rock. This belt varies in width up to 300m. wide, but mostly much narrower, and is present pretty much around the lagoon shore of Wake Islet. On such short examination it is hard to evaluate the change in this area.

Over the ~~majority~~ largest part of the area of all three islets the vegetation was evidently almost completely destroyed. Ditches, tank traps, platforms, mines, buildings, gun emplacements, revetments, and underground installations are almost everywhere, with refuse of all

sorts, very abundant. According to Munson, CAA manager, four years ago the vegetation, generally on the island, was about a foot high. Now the dominant growth is a stand of Messerschmidia 10-15 or more feet high. Brown, engineer for CAA, says that in favorable sandy places Messerschmidia will grow 6 feet a year. Over large areas the present vegetation is a solid stand of Messerschmidia. On the south side, west of Peacock Pt, there is some admixture of Scaevola, not common elsewhere. A little Pemphis is scattered in here and there, generally. Near Peacock Point and elsewhere a scrub of

Cordia from 1-2 m. tall and very dense, is common locally. This is probably second-growth.

That the general Messerschmidia vegetation is second-growth is obvious from the lack of trunks more than 1 dm. thick and the fact that this scrub grows on embankments and piles of coral rubble that clearly date from the war.

In open places, generally Pluchea odorata forms a scrub 1-2 m. tall. This is generally healthy, but in places is conspicuously chlorotic.

On denuded areas Cenchrus echinatus is common, and in many of them Euphorbia heterophylla is abundant, at this season mostly completely dried up. Very chlorotic locally, when dry.

While Bryan noted only one patch of Ipomoea pes.-caprae and one patch of Gossypium, both are locally common now on many parts of ~~the~~ Wake ~~Island, and sometimes on Peale Islet~~ and Peale Islet. the latter, esp. around the old seaplane ramp.

The Japanese must have planted the Gossypium, as it occurs consistently around their old installations.

In the interwale between the trees Boerhavia of two forms is extremely common, also an erect, green form of Portulaca lutea. Portulaca oleracea is commoner near installations.

Messerschmidia is said to be killed by salt water on its roots from very high tides - acc. Mr. Brown there is an area of 3 acres where it was killed and has not shown signs of coming back, as yet.

Some patches of Cynodon dactylon exist on the island. Much more was planted last fall, but few seeds sprouted, as there was little rain from December to April. Messerschmidia in many places looks dried up. Pisonia and Cordia are more or less defoliated, and the Cordia sometimes dead at the tips.

Here and there, in excavations and bomb craters, is standing ~~p~~ brackish water, one of the ponds being an acre or more in extent and locally called the Lake. These ponds and pools have a mat of a Vaucheria-like alga locally on top, and flourishing population of mosquito fish. There are also dragon-fly larvae. The water tastes perceptibly brackish. What so many fish live on, since the mosquito population has been reduced is not clear. The fish were planted about 8 months ago by Mr. Schultz, from a stock introduced from Hawaii about 4 years ago into a concrete reservoir on Peale I. by Suitomo, a Samoan now with Pearl Harbor Police Dept. The fish are still numerous in this reservoir. There is no plant of Eichhornia crassipes left in this reservoir, ~~at~~ out of a formerly larger stand. They have been taken by people to plant in aquaria, etc.

A limnological study would be of interest.

1 p. in Honolulu

Until a year ago there were said to be untold numbers of rats, flies, and mosquitoes (one Culex, two Aedes sp.) on the island.

Mr. Frederick Schultz.
3919 Waialae Ave. Honolulu 55, T.H.
(present c/o CAA, Wake I.)
in Feb. 1951 undertook pest control operations.

Mosquito breeding places were eliminated or stocked with mosquito fish. Garbage and other fly breeding material was eliminated, garbage dumps regularly burned. Rolled oats poisoned with Wolferan (?) was used in a systematic campaign against the rats. The success of this may be measured by the fact that in 2½ days covering the island with Mr. Schultz one rat was seen, no mosquitoes, and only a very few flies. In his weekly examination of poisoned baits, in covered trays (like miniature gopher baits) he finds less than 5% touched by rats.

Feeding tests by Schultz showed that the rats commonly eat the young fruits and fleshy

fruiting bracts of Ipomoea tuba. He finds this quite consistent with the fact that rats were usually very numerous in tangles, ~~and~~ thickets, and mats of this plant. It would also supply water, of which there was none available naturally except after rains before the war.

The system of baiting was to establish parallel lines of baits across the island, ~~a~~ series of them, examining and re-baiting every day, till they were not disturbed much any more, then to move the series farther apart, doing the same thing over repeatedly, till the ends of the island were reached, then maintaining a few lines of baits as checks, examining these every week. As long as the % of baits visited is below 10% the rats are considered controlled.

Birds seen on Wake –

A few common noddies, flying, one nest but not sure if occupied.

A large rookery of sooty terns (? back and wings very black, crown black, forehead with a white ▽, bill & feet black, under-parts white. – young sooty-brown, speckled with white on back, sooty gray beneath, when fully feathered. In pin feather stage light gray downy beneath, sooty brown on back and sides) on lagoon side of north hook of ~~of~~ Wake Islet. Young in various stages, no eggs seen.

Many frigate birds seen, principally roosting on remains of an old pier on Peale Islet in lagoon.

Occasional fairy terns flying.

Some boobies, nesting on Peale Islet, in trees. Sp. not det.

One tattler on lagoon beach.

Two plovers seen, but Mr. Schultz says there were many only a day earlier.

 1952 Wahe'l

Dogs & cats both seen, domestic.

Gardens seem mostly unsuccessful when just planted in the ground. (see p. 130). Around an old Japanese garden site Amaranthus viridis, A tricolor(?) Ipomoea batatas and Nicotiana tabacum persist.

The method of gardening used most successfully is to frame up top-soil about 6" deep, surrounded by 1x6 boards. Then water this well, shade it with leafy branches of Messerschmidia. In this sort of arrangement at Pranklean compound, tomatoes, lettuce, Broccoli, parsley, dill, onions, beans, radishes, were growing successfully.

Around this compound were small plants of Ficus carica, Thespesia populnea, Ficus sp., Casuarina equisetifolia, Sorghum vulgare var. technicum (broomcorn), Catharanthus roseus, Terminalia catappa, Euphorbia pulcherrima, Cucurbita maxima (flat white summer squash).

In pots were Codiaeum variegatum, Chrysophyllum cainito?, Bauhinia sp. Mangifera indica. Eucalyptus citriodora. ~~Samanea saman~~ guaiaum? Capsicum frutescens, Zea mays (reached maturity but very spindly, with abortive ears; grown in a drum of soil. Cucumber at least flowers. Carica papaya gets several feet tall, then dies.

Around houses in housing area - one coconut with trunk 2 m. tall; one Pandanus tectorius 2 m. tall.

In pots at least two species of Kalanchoe, Bryophyllum pinnatum, Sansevieria zeylanicum (?), Echeveria sp. etc.

The soils are generally coral rubble, with here and there a slight ~~[illegible]~~ coloring by humus; under Pisonia grove a black friable soil on the coral rubble. In one spot, site of old Japanese garden a small area of

 1952 Wake 7.

dark brownish gray fine soil. Part of this is a cemented platform of brown rock - possibly phosphate. Sample #129.

The north side of Wake Islet is a boulder beach, with continuous beach rock below high tide level, overlain landward by beach-conglomerate. This is topped by the boulder beach and boulder ridge.

This is the locality described by Bryan 1922 as having an impenetrable barrier of vegetation. Now it is completely cleared, having only scattered brushes and herbs. There were large gun emplacements, etc. here.

May 18 - Munson Hill
s.e. of Falls Church
Old field being thickly
invaded by mixed
stand of young trees,
some older trees.

34484 Maclura pomifera — small rounded tree
6 rare in — 5 m. tall, flowers ♂, mainly on older wood of long wand-like twigs.

6 85 Morus alba — shrub 2.5 m. tall,
occasional in. — fruits immature.

5 86 Acer SACCHARIUM L. — old tree 10 m. tall, steril
rare in grove on top of hill.

~~10 87 Hedyotis purpurea var. purpurea~~

May 25 Sleepy Hollow
1½ mi. s. of Falls Church
~~on~~ near Tripps Run
Open slope in pasture
with scattered brush
and springy ground

10 87 Hedyotis purpurea var. purpurea
common on slope

5 88 ~~Callitriche~~ Hydrocotyle ranunculoides L.f. — floating leaves expanded.
common in spring-fed pool.

5 89 Hydrocotyle ranunculoides L.f.
common in spring-fed pool

 1952 Maryland

June 1 - Head of Broad Creek

shore of fine sand, slightly brackish water

34490 Peltandra virginica
3 common

clumps, leaf-blades more or less erect, quite variable from clump to clump.

34490-(3)

34490-(3)

 1952 Maryland

June 1 - Head of Broad Creek

shore of fine sand,
slightly brackish water

34490 Peltandra virginica
3 common

clumps, leaf-blades
more or less erect,
quite variable from
clump to clump.

June 6 - Holmes Run,
just above Lake Barcroft
area cleared for sewer
10 years ago, with thickets
along creek banks, wooded bottom-land.

34491 Fraxinus pennsylvanica MARSH. — Tree 10 m. tall, partially
" in bottom-land flooded — dead from flooding.
by low dam in creek

" 92 Fraxinus americana L. — same
same

" 93 Betula nigra — tree 10 m. tall, 2.5' dm.
thickets along creek bank — thick, bark pinkish,
~~p~~ shaggy; ~~steriles~~
leaves glaucous
beneath; sterile.

" 94 Physocarpus opulifolius — shrub 2 m. tall, branches
thickets along creek banks — arching; fruits dull
red.

" 95 Carex — culms weakly
open grassy area — arching
" 96 Penstemon — erect; flowers
common in open area — dull purplish white.

46 numbers

Dec. 16/52

Ngariungs Islet.

1	Pisonia grandis R. Br.	tallest tree
2	Scaevola frutescens (Mill.) Krause	
3	Messerschmidia argentea (L.f.) Johnst.	
4	Barringtonia asiatica (L.) Kurz	
5	Pisonia grandis R. Br.	tallest tree
6	Terminalia samoensis Rech.	
7	Cassytha filiformis L. (Kl. & Gbe.)	parasitic on no B
8	Euphorbia chamissonis Bois.	
9		

Dec. 16.

Ngajangel Islet (main islet)

(2) 9	Crataeva speciosa Volk.	
10	Epipremnum pinnatum (L.) Engl. ?	~~young growth~~
11	Vigna marina (Burm.) Merrill	
12	Asplenium nidus L.	
13	Nephrolepis hirsutula (Forst.) Presl ?	
14	Ficus ~~sp.~~ senffiana Warb.	Tree 10 m. high
15	Pipturus argenteus (Forst.) Wedd.	
16	Epipremnum pinnatum (L.) Engl. ?	young growth?
17	Ochrosia oppositifolia (Lam.) K. Schum.	
18	Pandanus tectorius Parkr.	
19	Acalypha amentacea var. carolinensis	
20	Clerodendrum speciosissimum Van Geert Valk.	
21	Cycas circinalis L.	
22	Fleurya ruderalis (Forst.) Gaud. ex Wedd.	
23	Portulaca samoensis v. Poelln.	
24	~~Achyranthes aspera~~ Canavalia microcarpa (DC.) Piper	
25	Elatostema calcareum Merr. ?	
26	Asystasia blumei ~~Nees~~ Nees	
27	Phyllanthus niruri L.	

Dec. 16

Ngajangel Islet.

28 Polyscias fruticosa (L.) ~~Forst.~~ Harms
(2) 29 Eugenia javanica Lam.
30 Wedelia biflora (L.) DC.
31 ~~Ficus sp.~~ unrecognized seedling — species seedling
32 (2) ~~Ernodea~~ Triumfetta procumbens Forst.
(2) 33 Achyranthes aspera L.
34 (2) ~~Phyllanthus speciosus Volk.~~ lepturus repens (Forst.) Rob.
35 Centella asiatica (L.) Urb.
36 Polypodium scolopendria Burm. f.
37 Nephrolepis ~~sp.~~ biserrata (Sw.) Schott
38 ~~Ischaemum speciosum Volk.~~ ~~Cabra?~~ Ochnosia oppositifolia (Lam.) K. Schum. ?
39 Acalypha amentacea var. carolinensis
40 Digitaria longiscina Mez
41 Ischaemum muticum L.
42 Eragrostis amabilis (L.) W. & A.
43a Digitaria pruriens var
~~44 Leptochloa repens~~
~~45 Cabara?~~
~~46 Triumfetta barbata?~~
~~47 Triumfetta procumbens~~
~~48 Leptochloa repens~~
~~49~~
~~50~~
~~51~~
~~52~~
~~53 Rhynchosia angustifolia~~
~~54~~
~~55~~
~~56~~
43b Digitaria timorensis (Kunth) Balansa

Palau

Dec. 1952

Auluptagel Island near Koror.

44 (2) Pouapea palauensis Kaneh.

5045 (2) Gulubiopsis palauensis Kaneh.

46 Pandanus aiminiikensis Mart.

G. C. Gressitt coll.

also common in hill jungle on Babelthuaps

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